FEBRUARY 20, 1956 50 Cents

AVIATION WEEK

A McGRAW-HILL PUBLICATION

Regulus at Sea

Japanese Industry Arrives at Jet Age

First in Constant Speed Drives...

SUNDSTRAND

New electrical concept in F-102A attributed to Sundstrand Constant Speed Drives

The advanced Air Force F-102A all-weather supersonic interceptor, built by Convair, incorporates the new concept in electrical systems. Here, due to the Sundstrand Constant Speed Drive, is an automatic constant frequency a-c system providing plenty of stable power, with heavy overload capacity under all flight conditions. Here is reliable power for optimum operation of electronic devices which make the F-102A a modern, integrated, all-weather weapon. And here is another example of how the new concept in electrical systems . . . fostered by Sundstrand's Constant Speed Drive . . . meets the challenge of today's . . . and tomorrow's . . . fast, high-flying jet aircraft. Can we help you?

New Electrical Horizons . . .

are opening to design engineers, through co-operation between engine and airframe manufacturers and Sundstrand. With this new concept in electrical systems, expect remarkable advances in operation and performance of tomorrow's aircraft.

SUNDSTRAND AVIATION

Division of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS Western District Office: Hawthorne, California

CONSTANT SPEED DRIVES · AIRCRAFT ACCESSORIES

WHY DOES AN ATHLETE "WARM UP"?

—the answer is the key to the peak performance of Goodyear Airplane Tires

The purpose of an athlete's "warm-up" is commonly said to be to "loosen up" his muscles. Actually the reverse is true. Through this exercise he is really tightening his muscles—toning them up and getting them ready to deliver top performance.

In this lies the key to the top performance of the Triple-Tempered 3-T Nylon Cord built into Goodyear Airplane Tires.

For this specially processed Nylon is an organic fiber—and as such reacts very much like human skin and muscle. You might say it has a "memory"—when subjected to tension and strain, it tends to resist change.

So, Goodyear's multimillion-dollar processing equipment prestretches and sets the 3-T Nylon Cords under heat. It then has what engineers term "a negative coefficient of expansion"—it tends to contract, or tighten up, when it encounters the heat and strains of tire service.

This makes 3-T Nylon ideal for high-speed, high-impact airplane tires. It has the strength to fight back. It tends to control tire growth in service.

As a result of these qualities, obtained by the patented 3-T processing, Goodyear Airplane Tires—both tubeless and tube-type—have achieved a spectacular record of outstanding performance on today's high-speed aircraft.

Goodyear, Aviation Products Division,
Akron 16, Ohio, and Los Angeles 54, California

GOODYEAR
AVIATION
PRODUCTS

FACILITIES + ABILITIES = EXTRA *plus* IN PERFORMANCE

Design, Development, Production

CASE HISTORIES

of Weber Aircraft Corporation

subject:
EJECTION SEATS FOR B-47

Weber Aircraft Corporation, 2820 Ontario Street, Burbank, California

WEBER PRODUCES 1000TH SET OF B-47 EJECTION SEATS

The 1000th set of Weber designed and produced pilot and co-pilot ejection seats for the Boeing 6-jet B-47 medium bomber was delivered to Boeing representatives at a recent ceremony to mark the completion of a significant phase of this production assignment. Production deliveries are being made to Boeing–Wichita, Douglas–Tulsa and Lockheed–Marietta to keep pace with their line requirements.

Seats incorporate lightweight forgings, simple mechanical system

In early 1953, Weber engineers were called upon to design these seats specifically for the B-47, which broke the transcontinental record in 1955 by flying from coast to coast in 3 hours and 24 minutes. In the design, a simple mechanical system is used instead of a complicated hydraulic system. Another Weber innovation is the extensive use of forgings for extra rigidity and light weight. Unusual features of the co-pilot seat are the tilting motion and a swivel ring that permits 180° rotation. This seat structure and the ring transmit all seat loads to the floor with no other structural connection.

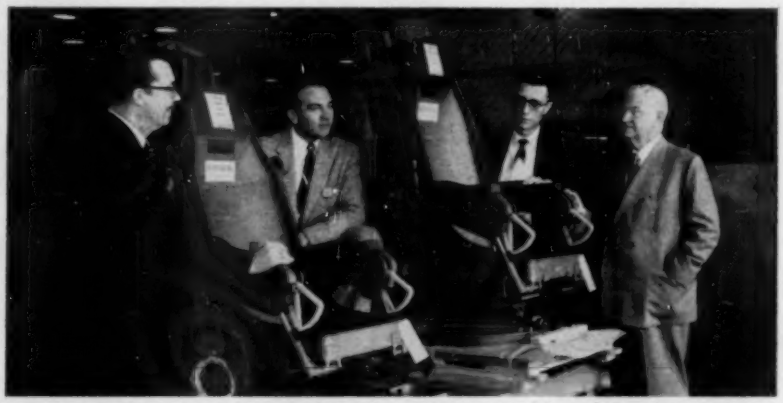
Thorough testing at every stage

During the prototype phase of the program, the seats were subjected to fully-instrumented static and functional tests at the Weber test facility and firing range. Prior to delivery, all seats are put through complete functional tests in which ejection conditions are simulated. Electrical and mechanical functions are carefully checked out on pneumatic checkstands.

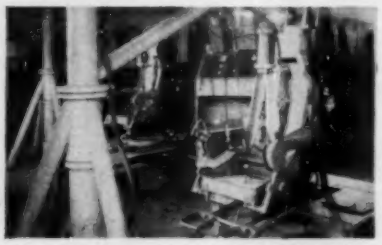
Weber builds in dependability

In every phase of this, and all Weber design and production programs, constant checks, tests and quality control inspection make certain complete reliability is built into every product. This is just one of the reasons why, more and more, the aircraft industry is turning to Weber for the design and production of interior equipment, components and subassemblies. For the *difficult* problems, the aircraft industry has learned to plan with Weber.

The Boeing B-47, fastest operational bomber in the world, is equipped with lightweight Weber pilot and co-pilot ejection seats.



Executives who met to witness the delivery of the 1000th set of Weber designed and produced B-47 ejection seats: (left to right) O. R. Jordan, Resident Air Force Quality Control Representative; H. F. Kasten, Boeing Quality Control Supervisor, Los Angeles Area; K. B. White, Los Angeles Representative, Boeing, Wichita; and E. K. Meredith, President, Weber Aircraft Corporation.



A set of Weber B-47 seats is mounted in the rigs for typical instrumented tests. Electrical and mechanical functions are thoroughly checked before delivery.

Weber production personnel, responsible for the success of the B-47 ejection seat production program, shown outside the Weber plant at Burbank, California.

Manufacturers of:
Ejection Seats / Pilot and Crew Seats / Passenger Seats / Buffets, Wash Basins and Other Interior Equipment / Acrostands / Airframe Sub-assemblies

WEBER AIRCRAFT CORPORATION, 2820 ONTARIO STREET, BURBANK, CALIFORNIA

AVIATION CALENDAR

Mar. 6-8—Fourth Annual Air Line Pilot Association, Air Safety Forum, Shoreland Hotel, Chicago.

Mar. 14-16—1956 Aviation Div. Conference of the American Society of Mechanical Engineers, Beverly-Hilton Hotel, Los Angeles, Calif.

Mar. 19-21—Society of Automotive Engineers, national production meeting and forum, Hotel Statler, Cleveland, Ohio.

Mar. 19-22—Institute of Radio Engineers, national convention, Waldorf-Astoria Hotel & Kingsbridge Armory, New York.

Mar. 28—Air Transport Assn. Board of Directors Meeting, Statler Hotel, Wash., D. C.

Apr. 9-12—Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum and aircraft engineering display, Hotel Statler, New York, N. Y.

Apr. 10-11—Symposium for Management on Application of Analog Computers, sponsored by Midwest Research Institute, University of Kansas City, Kansas City, Mo.

Apr. 18-19—First Annual National Industrial Research Conference, sponsored by Armour Research Foundation, Hotel Sherman, Chicago.

Apr. 19-20—Annual Meeting of the Science Section of the Environment Equipment Institute, Sheraton Hotel, Chicago.

Apr. 22-26—American Association of Airport Executives, 29th annual convention, Hotel Carter, Cleveland, Ohio.

Apr. 30-May 4—Society of Aeronautical Weight Engineers, 15th national conference, El Cortez Hotel, San Diego.

May 2—Society of Aeronautical Weight Engineers, 14th annual conference, Fort Worth, Tex.

May 2-3—Air Traffic Conference of the Air Transport Assn., Hotel Radisson, Minneapolis, Minn.

May 2-5—Twelfth Annual National Forum of the American Helicopter Society, Sheraton-Park Hotel, Wash., D. C.

May 3-4—Sixth Annual Institute of Aeronautical Sciences, West Coast Student Conference, Los Angeles.

May 7—Ninth Technical Conference of the International Air Transport Association, San Remo, Italy.

AVIATION WEEK • FEBRUARY 20, 1956

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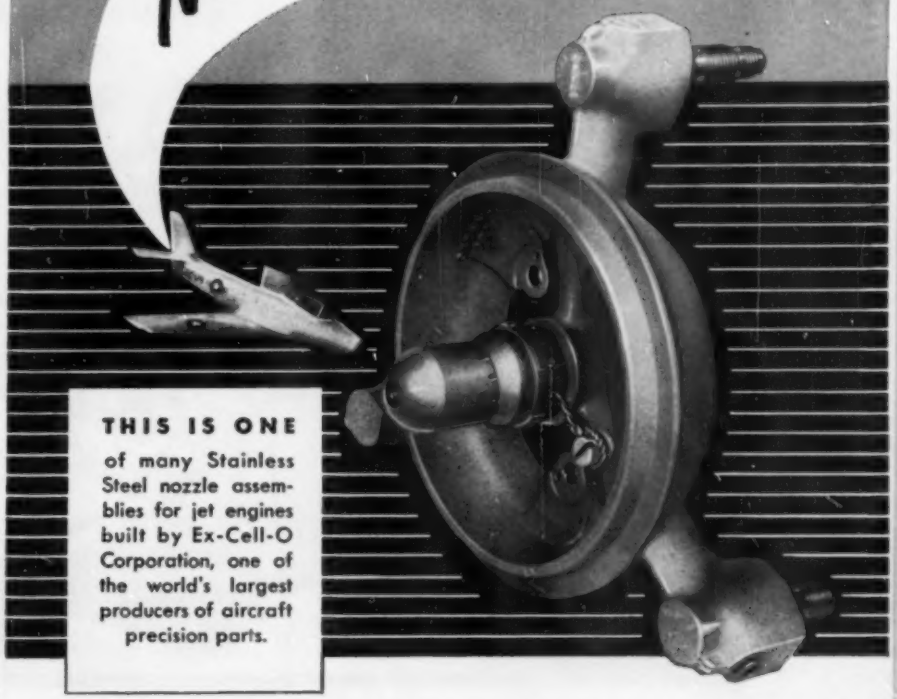
XLO

Nozzles for JETS

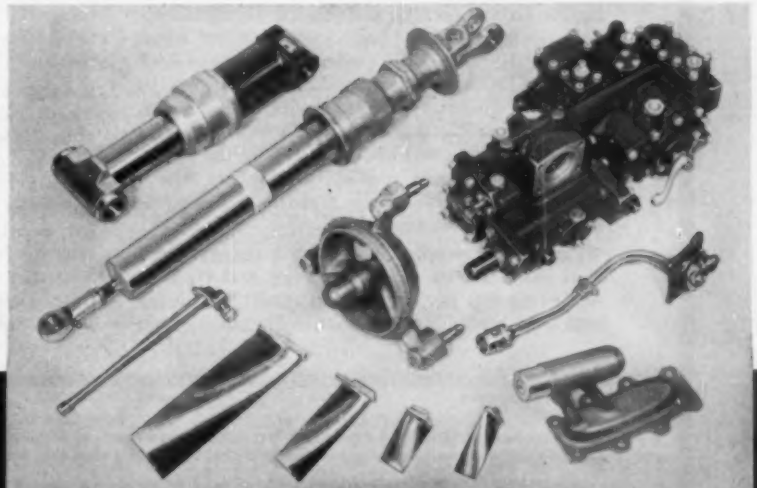


THIS IS ONE

of many Stainless Steel nozzle assemblies for jet engines built by Ex-Cell-O Corporation, one of the world's largest producers of aircraft precision parts.

There's *something of Ex-Cell-O* in practically every plane made in the U. S. A. today.

Illustrated below are typical blades, nozzles, hydraulic actuating assemblies and fuel control assemblies, precision built by Ex-Cell-O Corporation to aircraft builders' rigid specifications.



53-13

EX-CELL-O CORPORATION DETROIT 32, MICH.

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

another reason why **RYAN BUILDS BETTER**

HERE ARE 44 OF AVIATION'S MOST PRODUCTIVE ACRES

Ryan is a $30 million facility, superbly equipped for its job of serving the aircraft and engine industries and the military services. With 850,000 square feet of factory floor space, Ryan manufacturing includes "big" jobs like the huge Boeing KC-135 mid and aft fuselages and Douglas DC-8 jet engine pods and pylons. With the most modern machine tools for forming, welding, machining and heat treating, Ryan manufactures the exacting jet engine, afterburner, rocket and ramjet components which require surgeon-like skills and intimate knowledge of high temperature alloys.

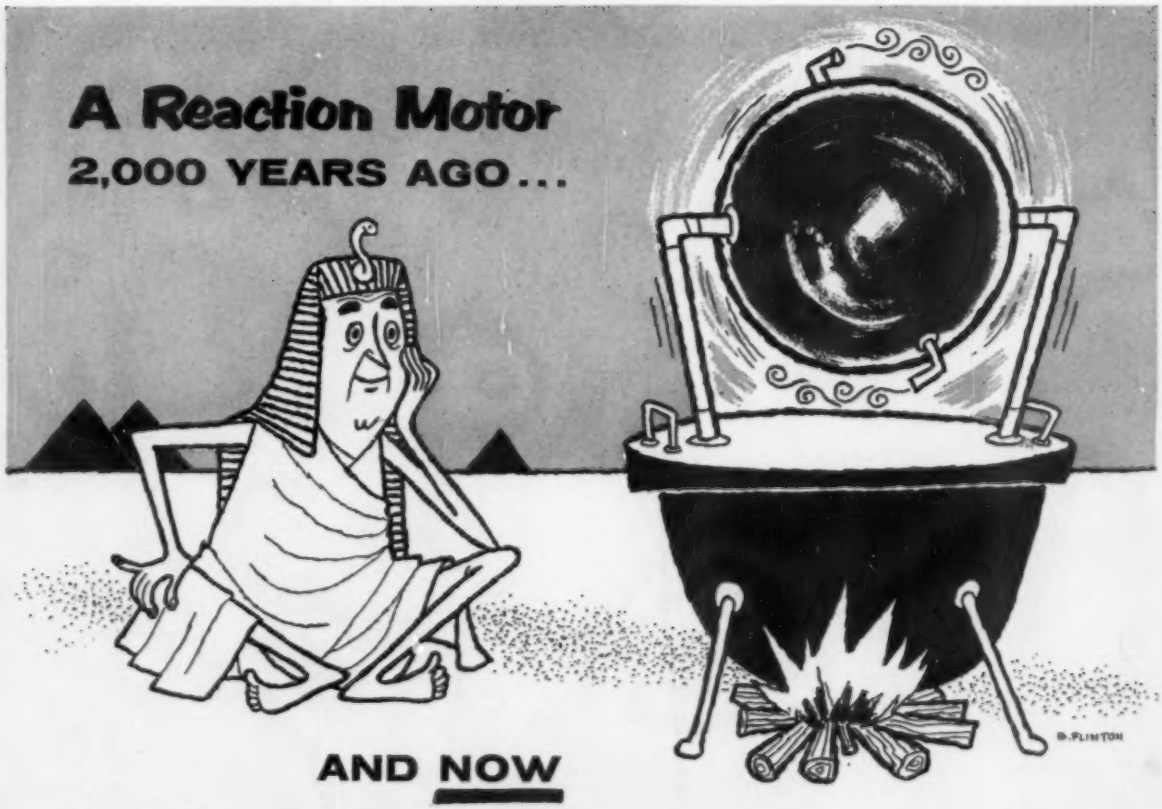
Ryan is 4750 people, headed by a management that has demonstrated experience and vigor in achieving top performance in quality, delivery and low costs. Ryan's financial stability and sound growth are widely recognized. Ryan's skilled production people are specialists who draw upon a background that covers 33 years of the half-century of flight. There is no parallel to the Ryan combination of experience, facilities and proven performance in its fields.

Ryan is a leader in research and development, which believes in "never letting well enough alone." One out of every six employees is in the engineering division. By enlightened attack upon aviation's complex problems, Ryan engineers are continually advancing the state of the art. Significant milestones in this steady progress are Ryan's all-jet VTO airplane, the world's first; the Firebee jet target drone and Ryan's unique electronic systems for automatic, global navigation and for missile guidance.

With a background of 33 years of experience in aviation, Ryan excels in designing and producing high quality aircraft, power plants and avionics, built at low cost, delivered on time.

Engineers looking for a challenging future will find outstanding opportunities at Ryan.

RYAN
AERONAUTICAL COMPANY
SAN DIEGO 12, CALIFORNIA



AND NOW

● Hero was a city boy from Alexandria (Egypt) who was always pyramid-lengths ahead of his class when it came to things mechanical. Tinkering around one day in the year 120 B.C. he came up with a gadget that would revolve indefinitely as long as he kept a brisk fire under it. Called the "Aeolipile," this device was a primitive reaction motor. But alas, Hero's engine ended up as a mere curiosity – for lack of an application.

Today, challenging new requirements are constantly creating the need for power sources which only rocket engines—modern reaction motors—can satisfy. RMI engineers have successfully harnessed this reaction principle for a wide variety of important airframe propulsion requirements and are extending the application of rocket power to other equally important fields.

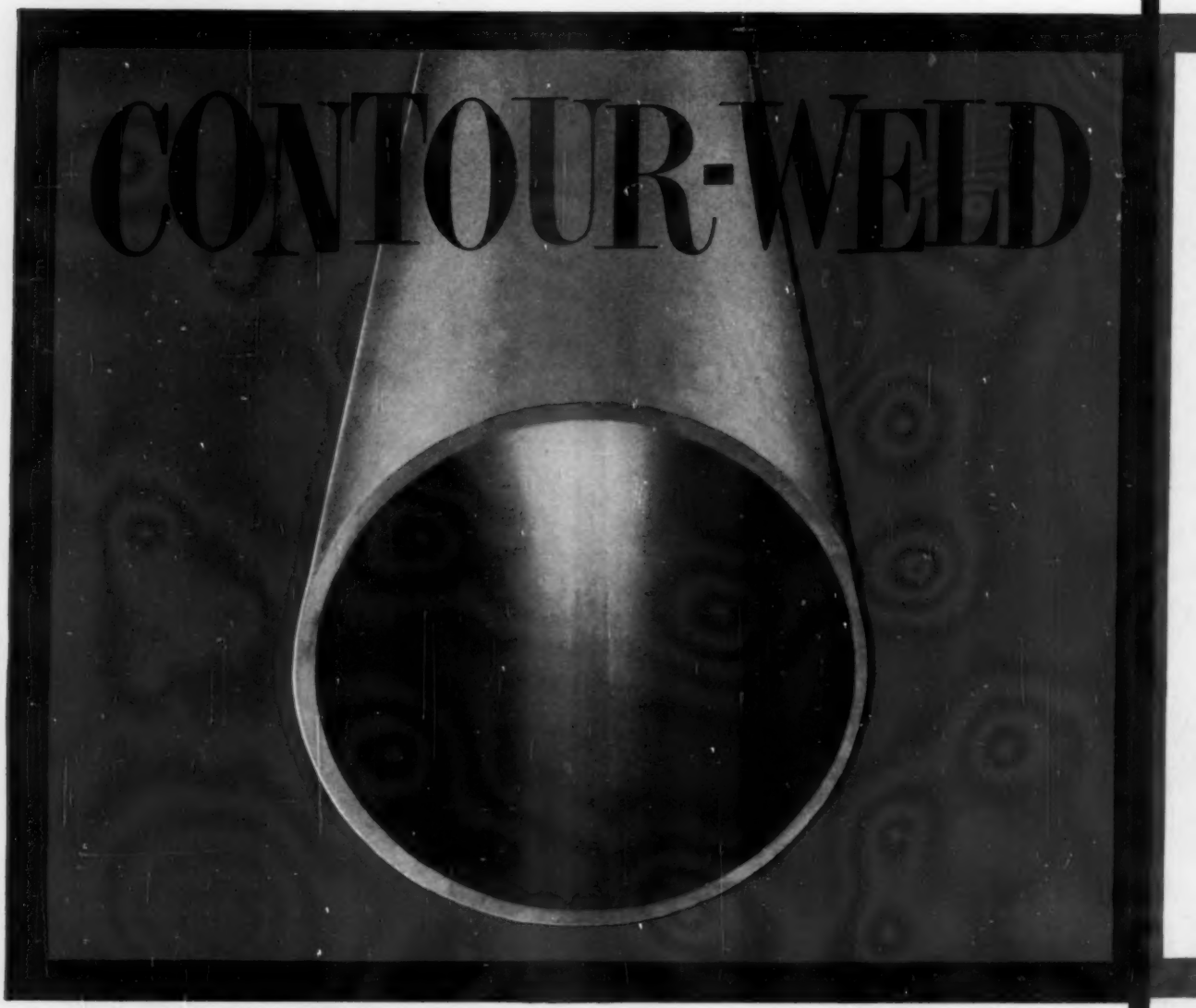
◀ Static testing a new RMI rocket engine of the most advanced design.

Spearheading Progress through Research

RMI

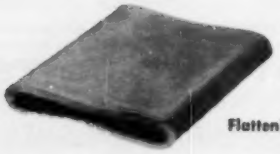
Career opportunities available for experienced mechanical, aeronautical, electrical and chemical engineers, physicists, chemists. Send complete resume to employment manager.

REACTION MOTORS, INC.
Denville, New Jersey
Affiliated with OLIN MATHIESON CHEMICAL CORP.



Flare and Flange

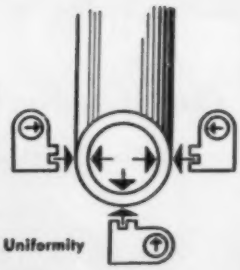
Pressure (Tubing)



Flattening

CONTOUR-WELD PIPE...BEST BY ANY TEST YOU CAN NAME

Reverse Bend (2⅜" O.D. x .154 Wall)



Uniformity

new stainless pipe

with a weld so smooth you can't even feel it

Run your finger over the weld area inside Trent's new *Contour-Welded** pipe. We doubt if you can even feel the weld. It's that smooth! There's no weld bead . . . no undercut . . . no place for corrosion or erosion to get a start.

Here's the reason: *Contour-Welding* is an entirely different method of producing welded pipe and tubing. It puts gravity to work to pull down the molten weld-metal to conform with the exact contour of the pipe. That means a smooth, clean weld practically indistinguishable from the pipe itself.

Contour-Weld Means Trent's Better Than Ever

As always, this new TRENTWELD pipe and tubing is made from uniformly rolled stainless strip. Wall thickness is always the same throughout the pipe . . . and *Contour-Welding* brings this same high uniformity to the weld zone itself. All this, plus Trent's superior cold-working methods, gives you a stronger pipe or tube, with smoother flanged or flared ends.

Try new TRENTWELD pipe or tubing on your next job. It's available in any gage, for all applications including high-pressure hydraulic lines . . . high-velocity systems . . . lines carrying corrosive chemicals. And new *Contour-Welded* tubing is available in most grades, including Hastelloy, Zirconium, Zircoloy, Titanium and 19-9-DL. You'll find that TRENTWELD can't be beat by any other pipe – welded or not.

*Contour-Weld is the trade mark of the Trent Tube Company for its process of welding pipe and tubing which is protected under U.S. Patent 2,716,692.

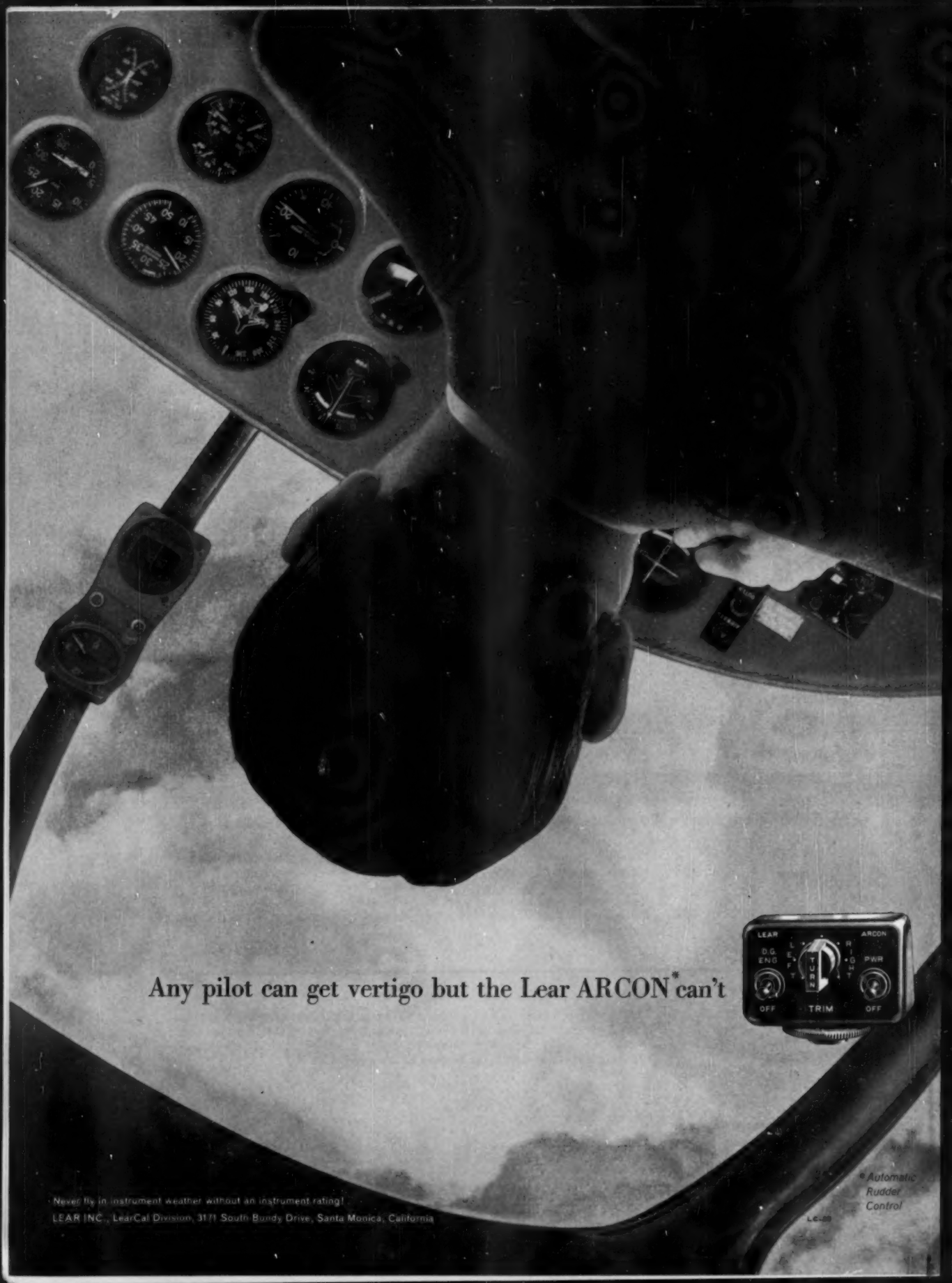
Why Trent's Exclusive Contour-Weld Process Means Smoother Welds . . .

Normally, in producing welded pipe, the weld is made at the top. But gravity plays a nasty trick. It tugs at the fluid metal in the weld zone, pulling it down toward the middle of the pipe. The result, particularly in the heavier gages, is a perceptible bulge where it hurts the most – right on the I.D. surface. If you try to get rid of the bulge – at fair cost – the metal is undercut – and corrosion and erosion start there.

But Trent put a stop to that – simply by going into partnership with gravity. With their exclusive *Contour-Welding* process, they weld at the bottom – and gravity works for them. For then, the bulge is in the opposite direction – blending in perfectly with the contour of the pipe itself.

TRENTWELD **STAINLESS STEEL TUBING**

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)



Any pilot can get vertigo but the Lear ARCON* can't

*Automatic Rudder Control

Never fly in instrument weather without an instrument rating!

LEAR INC., LearCal Division, 3171 South Bundy Drive, Santa Monica, California

Beyond the Point-of-No-Return . . .
A New Meaning for Dependability

DOUGLAS C-124

Most Magnetic Amplifier Voltage Regulators now flying are Cline built.

Regardless of the plane or the mission, rugged dependability means everything beyond the point of no return.

Cline Electric supplies new assurance of safe arrival! The Cline Regatrol, wide-frequency-range (380-1000 cycles) Magnetic Amplifier Exciter Voltage Regulator, with the USAF B-1 alternator, now in widespread use on the T-29, C-97, and C-124, has logged more hours of dependable flying time than any other military aircraft voltage regulator.

Cline Electric's Magnetic Speed-Positioning Devices have also proved their dependability in handling other complex electronic control problems.

Cline Electric means rugged, trouble-free dependability.

Controls by **CLINE ELECTRIC**

BUILDING PRECISION INTO TARGET ZERO

Aircraft Products Division
CLINE ELECTRIC MANUFACTURING COMPANY
3405 West 47th Street • Chicago 32, Illinois

99.7%
Reliability Factor
for
VICKERS®
VARIABLE DISPLACEMENT 3000 PSI PUMPS

IS EXPERIENCED BY
TWA
ON
749 Constellations

only 7 malfunctions in 2,026,064 pump hours

During a 5½ year period (July 1, 1949 to December 31, 1954) the TWA Accessory Shop overhauled 3000 Vickers Variable Displacement Pumps used on the cabin supercharger drives in their 749 Constellations. Of these, there were only seven malfunctions . . . all others were routine overhauls. In other words, only one of every 428 pumps scheduled for overhaul was for a malfunction. For the last three years the scheduled overhaul period for these pumps has been 1700 airplane hours.

Such reliability is another one of the reasons why TWA and other great airlines are large users of Vickers hydraulic equipment. For further information, ask for Bulletin A5203-A.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
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Application Engineering and Service Offices: El Segundo, California, 2160 E. Imperial Highway • Detroit 32, Michigan, 1400 Oakman Blvd. Arlington, Texas, P.O. Box 213 • Washington 5, D.C., 624-7 Wyatt Bldg. • *Additional Service facilities at:* Miami Springs, Florida, 641 De Soto Drive

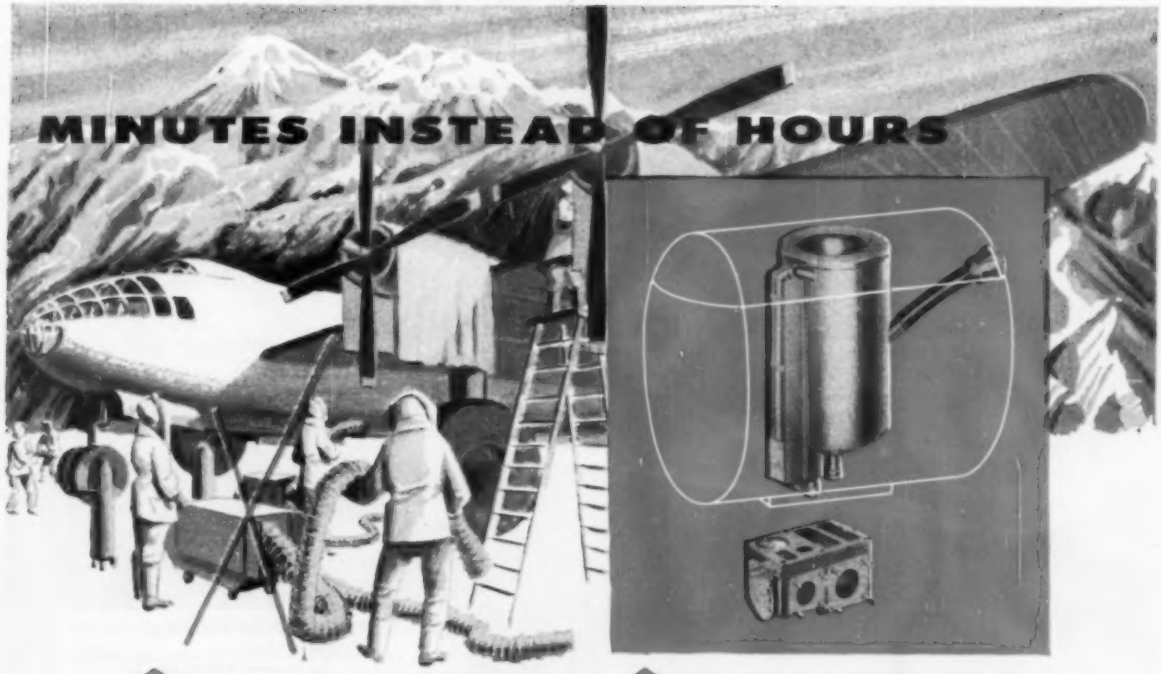
7344

TELEGRAMS: Vickers WUX Detroit • TELETYPE "TWX" DE89 • CABLE: Videt Detroit

OVERSEAS REPRESENTATIVE: The Sperry Gyroscope Co., Ltd.—Great West Road, Brentford, Middx., England

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

MINUTES INSTEAD OF HOURS



Engine heat-up time—external ground equipment—6 hours

Engine heat-up time—UAP cold weather oil system—30 minutes

Balance out the continuing use-cost of ground heating facilities with its attendant consumption of time and manpower against the one-time cost of the UAP COLD WEATHER OIL SYSTEM installation.

The UAP COLD WEATHER OIL SYSTEM is designed to furnish *fluid* engine oil after cold-soak at −65°F. without the application of external heat. This initial oil supply is then utilized after engine heat-up to thaw out the make-up oil in the tank outside of the hopper. Oxidation of the oil (sludging) is minimized by the system's deaerating features.

The system is for retrofit on most of the dry sump engines in use at the present time and is in every day service on more than 300 single and multi-engined planes.

Used in conjunction with UAP COLD WEATHER OIL SYSTEMS at temperatures lower than −30°F. is the UAP HOT FUEL PRIME SYSTEM which insures safe, reliable engine starts in 3 minutes or less. Both systems remain installed but inoperative during warm weather flying.

For prompt quotes on UAP COLD WEATHER OIL SYSTEMS cost and delivery factors on existing designs, please send detailed dimensional drawings of your oil tank to UAP Engineering, Dayton, Ohio. For descriptive literature covering both systems please contact any of the UAP Contractual Engineering offices listed.

Dayton, Ohio—MIchigan 3841
New York—Murry Hill 7-1283
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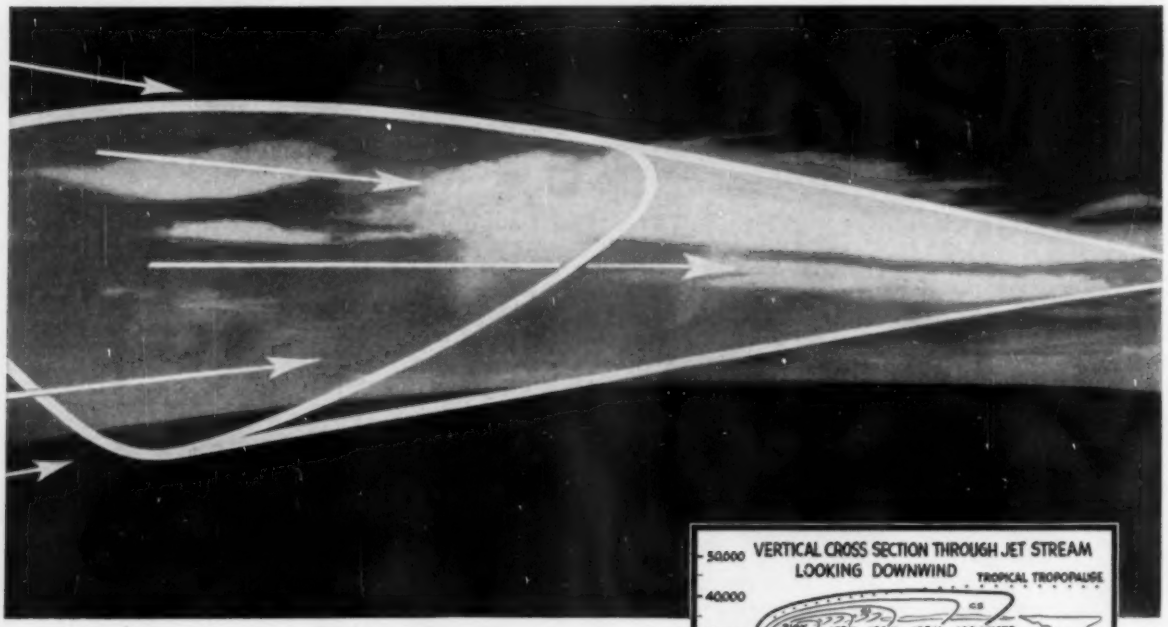
Montreal, Canada—ELwood 4131

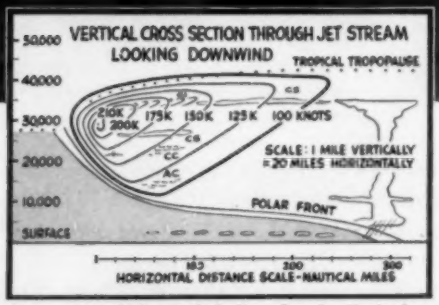
a famous family of aircraft essentials since 1929

UNITED AIRCRAFT PRODUCTS, INC.
1116 BOLANDER AVENUE, DAYTON, OHIO

FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau





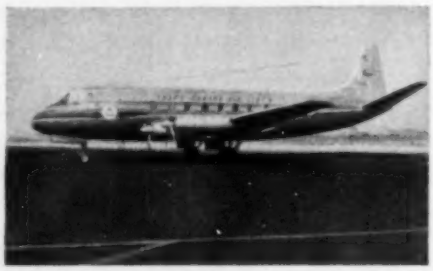
Clear air turbulence is believed to be limited to left-hand edge and top of jet stream. Rapid changes in temperature (10°F. or more in 1° latitude) occur on colder left side.

JET AGE DEVELOPMENTS

JET FLIGHT — As jet flight becomes more commonplace, it's increasingly important to understand and recognize the problems and phenomena associated with high altitude, high-speed travel. Clear air turbulence, sudden wind and temperature changes, subsiding air are some of the meteorological features now being explored.

JET STREAM—A recently discovered current of high-speed winds moves from the West across the middle latitudes of both hemispheres. Maximum wind velocities of over 200 knots are reached at altitudes of 35,000 to 40,000 ft., varying as much as 15 knots per 1,000 ft. up to the core. Cross-sectional view at upper right best shows jet stream structure.

JET FUELS — To meet the critical demands of substratosphere flights, jet fuels must also act as cooling agent. New manufacturing procedures developed by Socony Mobil can produce jet fuels with improved thermal stability to meet these critical requirements.



First fueling of turboprop airliners to go into commercial service in U.S.A. is being handled by Socony Mobil. The customer is Trans-Canada Air Line's Viscount Fleet.

Mobiloil AERO

Mobilgas AIRCRAFT

Best Pair to Get You There!

SOCONY MOBIL OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

B-52 + PHP* = -50 lbs.

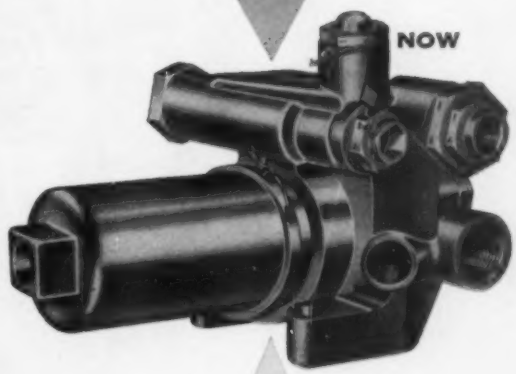
*Parker Hydraulic Package

Aircraft manufacturers are constantly trying to upgrade their products. Their engineers are engaged in a never-ending search for better equipment. In this search weight is always an important factor. Every pound—every ounce—saved is a step forward.

Parker's latest contribution to this upgrading and weight reduction is a Hydraulic Components Package, ten of which will be used in the new B-52, with a savings of over 50 lbs. per plane. Each package contains: two check valves, one depressurizing valve, one by-pass valve, one restrictor, one filter and filter bypass.

In packaging these components six housings are eliminated; fewer lines, fittings and mounting provisions are used; maintenance is greatly reduced; installation costs are cut; valuable space is saved; greater safety is achieved as fewer joints mean less potential leaks and weight is *greatly* reduced.

Similar packages are being designed by Parker for other installations.



Let a Parker Team help you

A Parker Team is available to assist you in designing a Hydraulic Components Package to meet your specific requirements for existing or proposed models. If you have any problem in hydraulic, fuel or check valves or are beginning system design get a Parker Team on your staff.

Parker

Hydraulic and fluid system components

Parker Aircraft Co. Los Angeles 45, Calif. • Cleveland 12, Ohio
(subsidiary of the Parker Appliance Company)

Announcing one of the most important issues of AVIATION WEEK ever made available to aviation advertisers . . . the 23rd Annual Inventory of Airpower Edition.

MARCH 12, 1956 . . .

Airpower in

"Airpower in the Atomic Deadlock" will feature a full-scale editorial roundup on the major phases of world airpower. Special charts, forecasts and expanded technical departments will focus on the gigantic task of keeping our airpower prepared to meet any new threat to the free world. In the tradition of past Inventory Issues, no effort will be spared to make "Airpower in the Atomic Deadlock" the industry's most useful reference edition.

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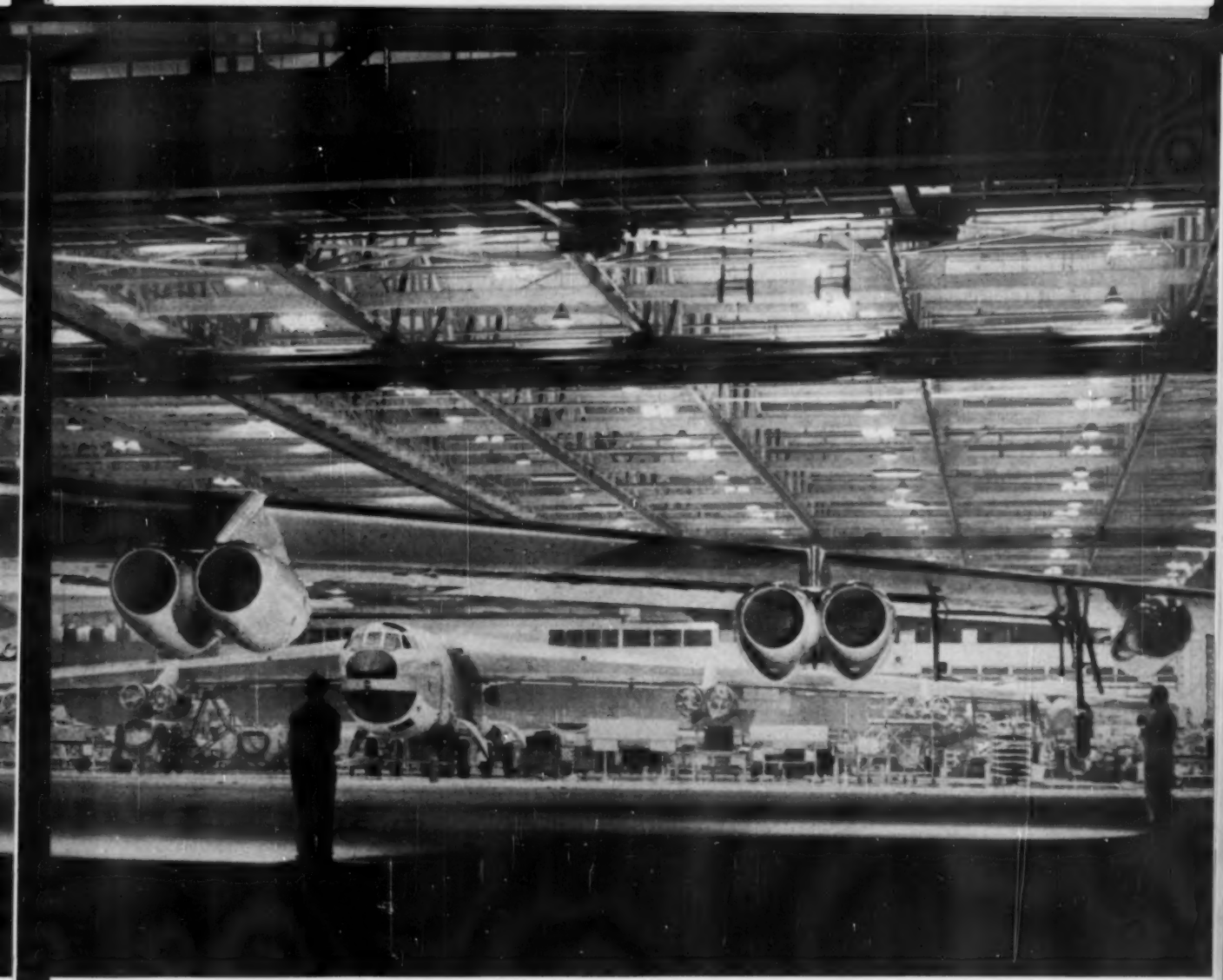

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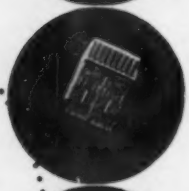

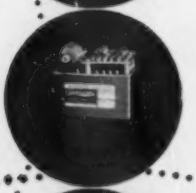

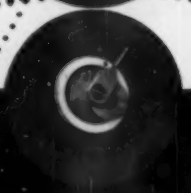

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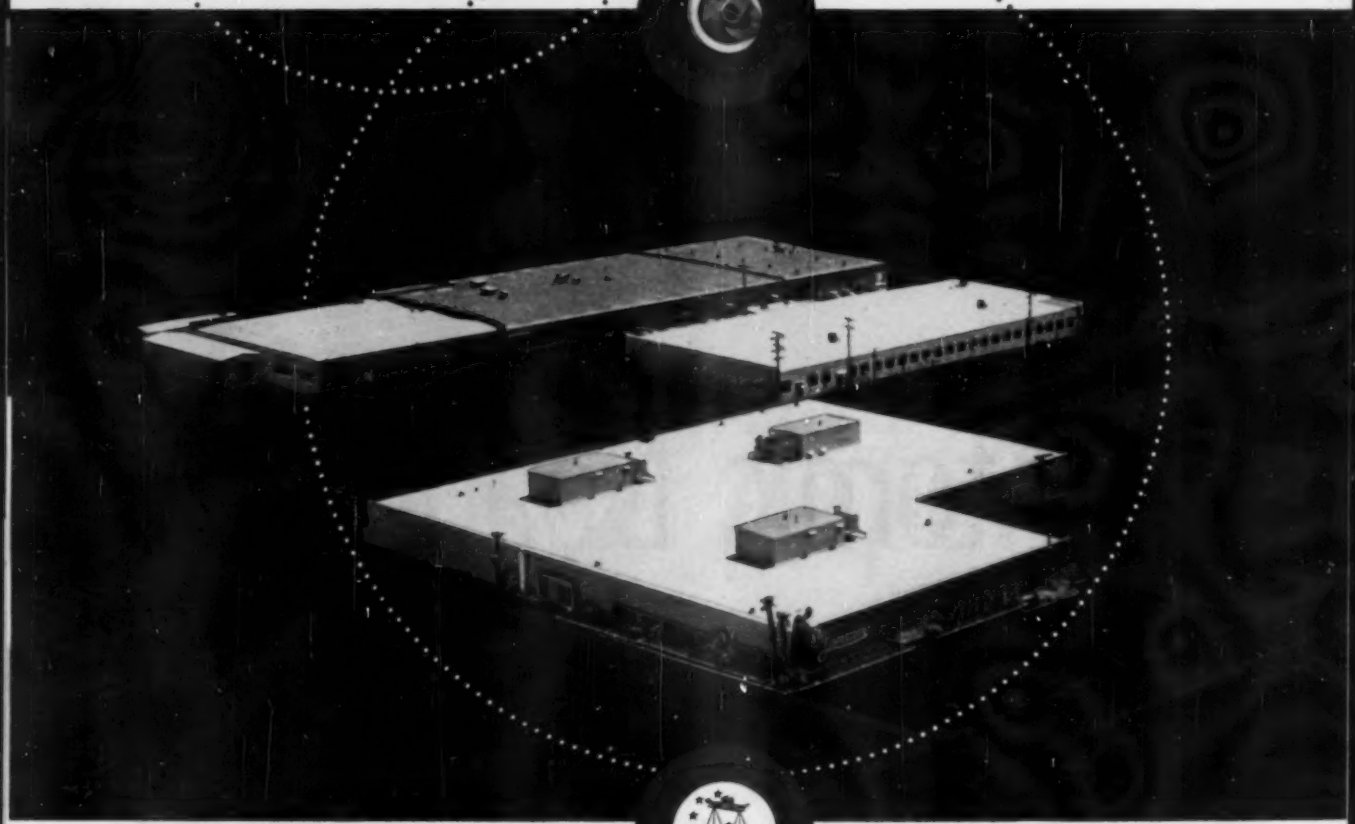

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COVER: Chance Vought Regulus, the Navy's first operational surface-to-surface guided missile, is hurled down deck of USS Hancock by steam catapult in test of the missile's new, lightweight launcher. The launcher, which makes such catapult takeoffs possible, replaces a cumbersome portable launcher-Jato system. For more pictures and detail, see page 29.

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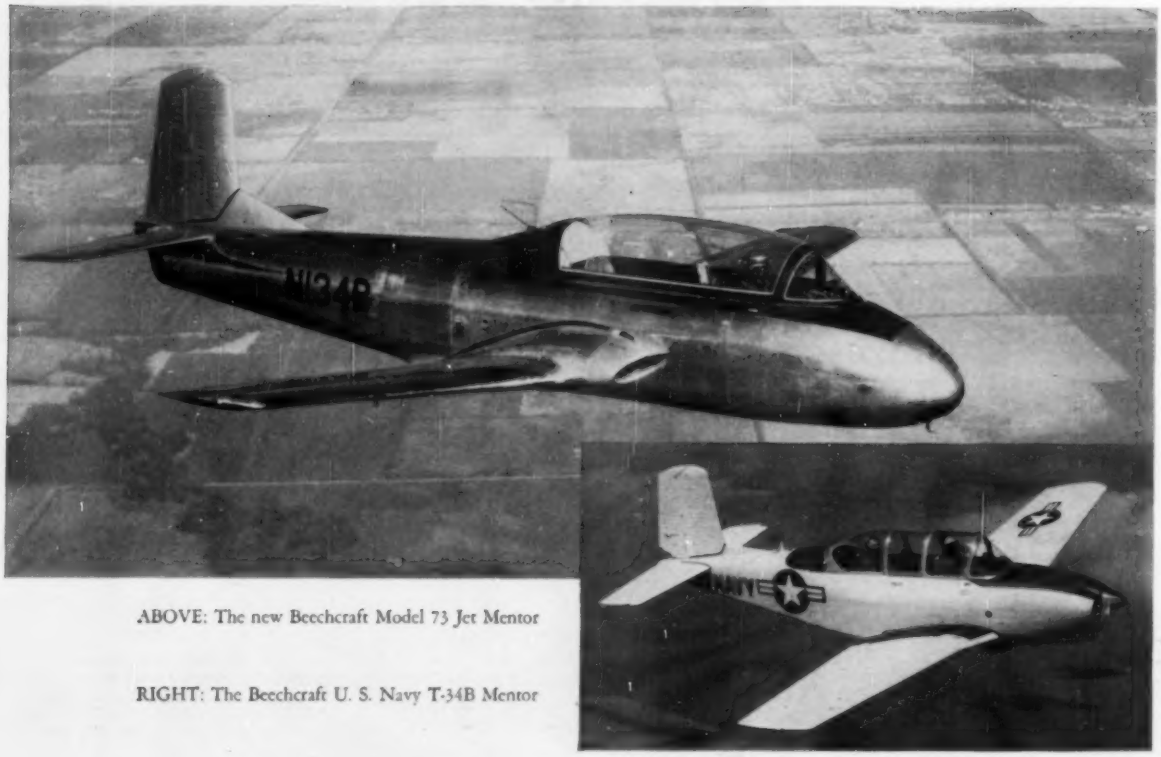


ABOVE: The new Beechcraft Model 73 Jet Mentor

RIGHT: The Beechcraft U. S. Navy T-34B Mentor

Sisters Under the Skin

THE NEW BEECHCRAFT Model 73 Jet Mentor is based on the tried and proven Beechcraft T-34, now serving the U. S. Air Force, U. S. Navy and five foreign nations. Both planes use many of the same component parts, and *feature* maximum performance, ease of operation and maintenance and outstanding economy. Both have been developed by Beech Aircraft as private ventures ready for military service throughout the world as "off-the-shelf" trainers.

Students could easily start right off in the Jet Mentor without previous flight instruction. On the other hand, the T-34 and Model 73 are so similar that very little transition would be required to convert from one plane to the other.

The new Beechcraft Jet Mentor represents a significant step forward in jet design simplicity. *It is heavy enough to take it, light enough to be the world's most economical jet trainer.*

PERFORMANCE AND SPECIFICATION DATA

(Engine: Continental J69-T-9 Turbojet)

Cruising Speed	245 mph
High Speed (at 15,000 feet)	295 mph
Diving Speed	500 mph
Service Ceiling	28,000 feet
Range (maximum with reserve)	450 miles
Gross Weight	4,521 pounds
Empty Weight	2,925 pounds
Useful Load	1,596 pounds
Load Factor (ultimate)	11.25 G's
Rate of Climb	1,400 fpm

Beechcraft

Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

BEECH BUILDS: T-34 Trainers for the USAF and USN; L-23 Transports for the U. S. Army; Jet Mentor; MD-3 Mobile Generators; Super 18 Executive Transport; Model D50 Twin-Bonanza; Model G35 Bonanza.

EDITORIAL

Confusion on the Missile Program

"Added to this increasing strength (Strategic Air Command) each month is our growing stockpile of intercontinental ballistic missiles which represents the most modern and devastating weapon of war in existence today."

This statement last week by Sen. Leverett Saltonstall (R.-Mass.), a former chairman of the Senate Armed Services Committee and now ranking minority member of that committee, is indicative of how little accurate information is being dispensed to the public these days on the state of this country's guided missile program. Everyone who has even the remotest connection with the missile program knows that the United States has no stockpile of intercontinental ballistic missiles; that it has none in operational service; that the first ICBM development program (Convair) is still in the prototype construction stage and that the second ICBM program (Martin) was just begun a few months ago.

When queried on the Saltonstall statement an Air Force spokesman replied (as reported on p. 25) that the only ICBM stockpile he knew of must be right in the Senator's office. When AVIATION WEEK checked Senator Saltonstall's office, we were told that the Senator's statement was correct but no further details could be given because of "Military security."

Russian Missile

What is even worse about Sen. Saltonstall's statement is that it was made at least four months after the existence of a Russian 900-mile ballistic missile was accepted as a fact by all of the top level defense and policy groups of the Eisenhower Administration.

Existence of this missile is such a well-known fact in Washington that President Eisenhower confirmed the Russian lead in this field at his most recent press conference, although he did not specifically identify the Soviet missile or its range.

The President said that while the Russians may lead in some fields of missile development, the U. S. leads in others. This is perfectly true. But the President did not specify that the Russians hold the lead in longer-range ballistic missiles, while our lead is in defensive, shorter-range missiles such as the Hughes Falcon air-to-air missile and the Convair Terrier and Bendix Talos surface-to-air missiles.

Symington Positive

Sen. Stuart Symington (D.-Mo.) has stated flatly (see p. 27) that the Russians have test fired a ballistic missile many hundreds of miles farther than we have. Sen. Henry Jackson (D.-Wash.), who holds posts on both the Armed Services Committee and the Joint Congressional Atomic Energy Committee, has warned that the Russians may beat us to the punch with a 1,500-mile intermediate-range missile.

The President has told the public that everything possible is being done to research and develop the missile program in this country "so far as my experts and my people in the Defense Department tell me."

This was in the same week that the top missile expert in the Pentagon, USAF Assistant Secretary Trevor Gardner, resigned in protest over the pace and scope of the entire aeronautical and missile development program and specifically charged that the missile program was not being pushed as hard as possible.

This sequence of events leaves the public wondering just who are the "experts" in the Defense Department on whom the President depends for his information. It also leaves a strong implication that the information he is getting is not as complete or accurate as it should be.

Congress Must Probe

In this welter of conflicting statements it is virtually impossible for the taxpaying citizen or the legislators who represent him in Congress to discern the truth about the relative status of the Russian and U. S. missile programs.

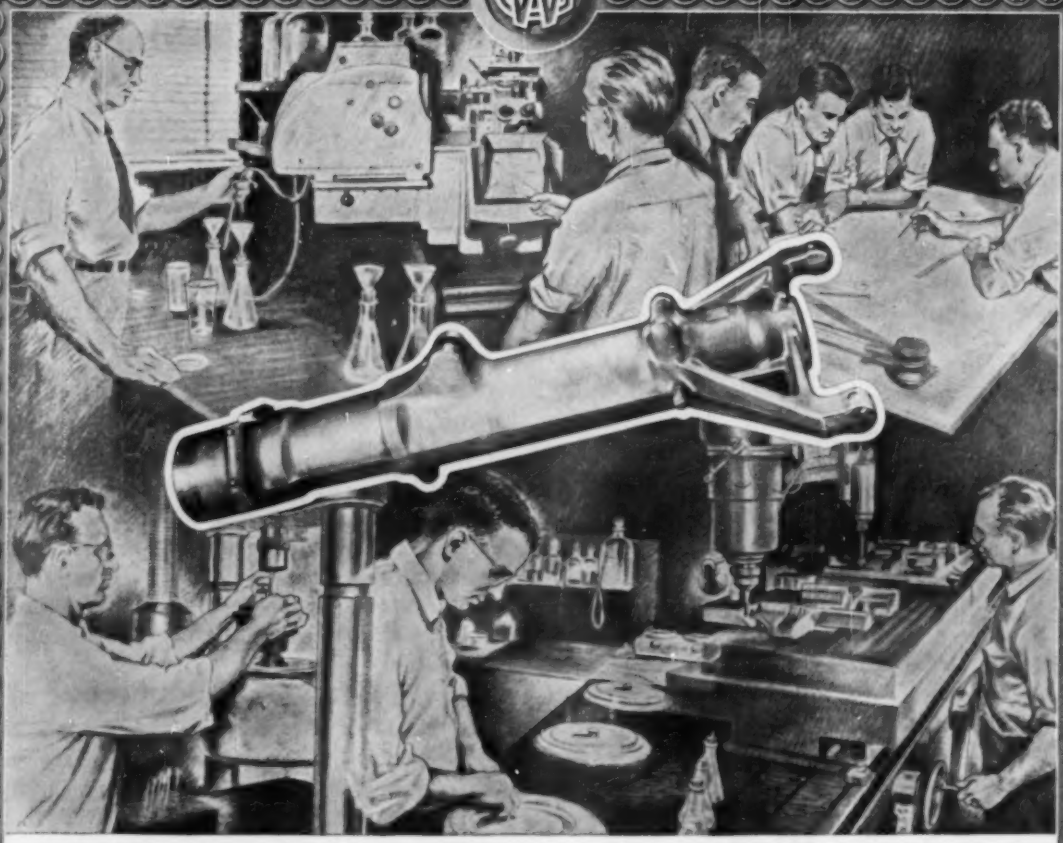
In the face of this mass of confusion on the missile picture Congress owes the citizens of this country a full and searching inquiry into the true state of our national progress in this vital field.

This inquiry should be conducted above the level of partisan politics and it must not be hamstrung by phoney claims of military security that are designed solely to conceal the truth.

HELP Curtis

President Eisenhower has made an excellent choice in the appointment of Edward P. Curtis to make a long-range study of civil aviation development problems and requirements. Mr. Curtis has a long and distinguished record in aviation that began as a fighter pilot in World War I, flying Spads and Nieuports in combat over France. His aviation knowledge has been tempered by years of business experience with the Eastman Kodak Co., of which he is now a vice president.

The job Mr. Curtis is tackling requires action to insure the proper growth of civil aviation as an integral part of our national fabric. Everybody in the aviation industry should give Mr. Curtis all the assistance and support he needs to do his job effectively. —Robert Hotz



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WHO'S WHERE

In the Front Office

Edmund T. Price, board chairman, Solar Aircraft Co., San Diego, Calif., formerly president of the firm; **Herbert Kunzel**, president of Solar, formerly executive vice president-secretary-manager, San Diego plant. **Frederick A. Schneller**, purchasing agent.

Harold G. Hynd, vice president-general manager, Tulsa Division, Douglas Aircraft Co., Inc., succeeding **Harry Woodhead**, resigned to take a special assignment at Douglas-Santa Monica.

George Friedl, Jr., director of advanced planning for new products, techniques and plant facilities, Link Aviation, Inc., Binghamton, N. Y., formerly vice president-manufacturing. **William W. Wood, Jr.**, formerly engineering vice president, assumes Friedl's former post; **John M. Hunt**, manager of the engineering division. **Monson H. Hayes, Jr.**, succeeds Hunt as research and development director.

John W. Myers, board chairman, Pacific Airmotive Corp., Burbank, Calif., succeeding **Thomas Wolfe**, resigned. **B. Allison Gillies**, vice chairman of the board.

Joseph C. Brenner, vice president-works manager, Sperry Electronic Tube Division, Sperry Rand Corp., Gainesville, Fla.

J. Lawrence Tecosky, vice president-contract manager, CDC Control Services, Inc., Hatboro, Pa. **Jack C. Boonshaft**, consulting mechanical development engineer; **Caldwell Jones**, contract engineer, **David P. Goodwin**, electronic development engineer and **Alfred Krieg**, procurement engineer.

Robert A. Vogeler, executive vice president, Rollins Electronics Corp., Lewes, Del.; **Adm. Robert H. Gibbs**, assistant vice president-administration.

Honors and Elections

L. H. Lentz, assistant director, engineering, Champion Spark Plug Co., new chairman of the Aircraft Gas Turbine & Rocket Engine Ignition Research Committee, Society of Automotive Engineers.

Carl Agar, Okanagan Helicopters, Vancouver, B. C., is president of Helicopter Association of America; **Don Larson**, Economy Pest Control, Yakima, Wash., HAA secretary and **Osvil York**, Allied Helicopter Service, is treasurer.

William A. M. Burden, life trustee, Columbia University.

Changes

Edgar A. Post, manager, Radio Systems Laboratory, Stanford Research Institute.

Maj. Gen. Leigh Wade, (USAF, ret.) member of public relations staff, Kemper Insurance Group, with headquarters in Washington, D. C.

Robert M. Cunha, assistant sales director, for five associated companies of Gulton Industries, Inc., Metuchen, N. J.

Roy Low, Jr., in charge of engineering data department, Gordon Enterprises, N. Hollywood, Calif.

Robert A. Gardiner, head of research and development, Electronics Division, Thompson Products, Inc., Cleveland, Ohio.

INDUSTRY OBSERVER

► Bell Laboratories has a new $12 million Army contract to develop a defensive missile against the intercontinental ballistic missile. Bell also has a study contract for the same type missile from the Air Force.

► **Hughes Aircraft Co., which developed the Falcon air to air missile, is developing the fire control system for Douglas Aircraft's Ding Dong air-to-air missile equipped with a nuclear warhead (AW Feb. 6, p. 23).**

► Nose cones now under development for intermediate and long-range ballistic missiles will be blunt rather than pointed to help in alleviating some of the main problems of re-entry into the earth's atmosphere during hypersonic descent onto the target. This nose layout is an optimum compromise between high skin friction involving high heating of the long conical shape and the high wave drag involving reduced performance of the blunt shape.

► **Martin Matador missile has a new packaging and logistics system that uses four steel drums and one packing crate to deliver a complete missile to a field unit. The five piece system replaces seven wooden crates used earlier in the TM-61 program.**

► Radioplane's new supersonic guided missile bears the designation MX-2013.

► **North American Aviation's new high altitude, rocket-powered research plane has been designated X-15.**

► Westinghouse has two new jet engines under development for the military with the designations XJ54 and XJ81. These are in addition to the XJ74 6,500 lb. turbojet now being tested by the Navy.

► **Anderson, Greenwood & Co. of Houston, Tex., is developing two high-speed tow targets for the Navy. One is a flexible type and the other rigid. Both will have a tow speed of Mach 0.8.**

► Boeing Airplane Co. is scheduled to display a full scale interior mock-up of its 707 jet transport in New York beginning early next month. Five-abreast seating will be featured with Boeing-designed chairs of unusual modern-classic design.

► **Watch for Convair to establish a separate guided missiles division to handle both its Navy and Air Force missile programs. Convair now builds the Terrier defensive missile at a Pomona, Calif., plant and is developing the Atlas intercontinental missile (SM-65) at its San Diego plant.**

► A Pantobase version of the Lockheed C-130 is under development and in preliminary layout at the Marietta, Ga. plant. Pantobase aircraft are intended to be able to operate off water, land, mud, ice and snow. First such design was the Stroukoff development of the Chase C-123.

► **Watch for KLM, the Dutch airline, to make key decision soon in the medium-range turboprop transport field. Competition is between the Lockheed Electra and Vickers Vanguard.**

► New gray paint that has become standard on USAF and Navy fighters armed with rockets or missiles is a protective coating to preserve aircraft skin against corrosive effects of hot rocket and missile gases.

► **Negotiations with India for production there of the lightweight Folland Gnat are nearing completion. An Indian mission is due in England this spring to sign final agreements with Folland and Bristol Aeroplane Co. for the Orpheus turbojet engine. The order will be for about 60 planes. Folland would build about 25% of the order with the remainder built in India.**

► Hawker Hunters are again being modified to eliminate difficulties encountered while firing their guns at altitude. First of the modified Hunters are due back in service before summer.

FLIGHT DATA IS TELEMETERED from test aircraft, like this modified RF-84F, to receiving equipment in the G-E Flight Test Center. Direct-writing recorders display the test data, allowing immediate engineering evaluation.

How telemetered flight test data speeds development of G-E flight control systems

By allowing engineers on the ground to evaluate test data while flight tests are in progress, a telemetering system is speeding the development of General Electric flight control systems. Any required in-flight adjustments to equipment or changes in flight test plans are radioed directly to the test pilot. This ability to refine the tests as they are in progress greatly increases the amount of pertinent data that is collected per flight.

General Electric has extensive experience in designing, developing, and manufacturing many types of flight control systems. Valuable experience has also been gained with tieing in flight control systems to bombing, approach, and fire control systems. All this experience is being put to use in building flight control systems for the latest supersonic aircraft.

FOR DETAILED INFORMATION on G-E flight control systems, contact your General Electric Aviation and Defense Industries Sales Office. Section 221-4, Schenectady 5, New York.

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Washington Roundup

ICBM Stockpile?

Defending the Administration's air power program against Democratic attacks, Sen. Leverett Saltonstall (R.-Mass.) pointed to "our stockpile of intercontinental ballistic missiles" as one of the mainstays of our military strength. He is ranking Republican and former chairman of the Senate Armed Services Committee.

Asked where USAF is keeping its stockpile of ICBM's, a weary Pentagon officer said: "Right in Mr. Saltonstall's office. It's the only one I know of."

This is Saltonstall's report:

"The Air Force program—to reach 137 wings at the end of the 1957 fiscal year—is a little ahead of schedule, and we will have 131 wings at the end of the present fiscal year. All medium bomber wings of the Strategic Air Command are now equipped with six-jet B-47's. These B-47's, together with a very large fleet of KC-97 tankers and an extensive overseas base complex, constitute our principal ready striking force. Added to this increasing strength each month is our stockpile of intercontinental ballistic missiles which represent the most modern and the most devastating weapon of war in existence today.

"I had occasion just last week to discuss this program with Secretary of the Air Force Quarles, one of America's leading research and development scientists. He gave me his personal assurance that this intercontinental ballistic missile program was receiving highest-priority attention. Our forces today represent a deadly deterrent for any country considering an attack on us because of their strength, their modern equipment and their ability to retaliate promptly with devastating effect."

Engine Profits

House Armed Services Investigating Subcommittee has not yet decided whether to hold public hearings on profits of aircraft engine manufacturers, helicopter manufacturers, and large military aviation subcontractors, after it completes its hearings on the 15 major airframe companies.

Basic information on these three categories—as well as the 15 prime contractors—was gathered by the staff during the Congressional recess from August through December of last year.

Rep. Edward Hebert (D.-La.), chairman of the subcommittee, said that the only definite decision on public hearings was to cover the 15 airframe companies.

Snark to Appear

Watch for a national picture magazine to print a missile story containing photos of the Army Redstone and USAF Snark. The pictures are officially unclassified but Defense Department had refused to release them to other newspapers or magazines. In this case the stamp of approval was given in top Defense circles, where Assistant Secretary Robert Tripp Ross carried the ball for the publication after standing firmly against release of the same unclassified material to the rest of the press. A conference of top service secretaries finally was held to pass judgment and now much of the Pentagon stands apprehensive of White House reaction when the article appears. Regular military officers in the Defense Department's Security Review Office were kept out of the proceedings, exercised no authority over the situation. Biggest joke to many of them is that one of the Snark illustrations submitted is a picture of a photomural on a wall at the officer's club at Patrick AFB.

USAF Speech Policy

Wide and obvious gap between statements of Air Force Secretary Donald Quarles and top USAF generals on relative strength of Soviet Russia in the technological race led to a new Pentagon rumor last week: That Chief of Staff Gen. Nathan F. Twining and his vice-chief, Gen. Thomas D. White, had been ordered to stop making speeches and statements. The truth is less drastic and much broader: USAF's Office of Information Services, headed by Brig. Gen. Robert L. Scott, Jr., has been told it will be held strictly responsible for the content of all USAF speeches.

Airmail Postage Increase

Postmaster General Arthur Summerfield has renewed his drive for postage increases—including an airmail increase from six to seven cents an ounce. But, as in the past several years, it has met with firm opposition in the Congress.

Shortly after Summerfield made his request for postage increase to offset the Department's deficit of $1,000 a minute, Sen. Olin Johnston (D.-S. C.), chairman of the Senate Post Office Committee, announced an extensive investigation to find other ways to cut Post Office costs. Johnston declared that "every effort should be made to reduce the deficit through maximum economies" before postage is increased.

Cold War Buildup

Defense Department has issued a new Pentagon "Fact Sheet" disclosing that the building's daytime population now is 29,000. Peacetime peak during World War II was 26,500 in April, 1945. Former Air Force Secretary Stuart Symington, now a Senate critic, points out that the increase of 2,500 includes a big jump in the number of Secretaries—from eight to 31.

Airport Politicking

The announcement of $39 million in new airport projects brought charges of Republican politicking against Secretary of Commerce Sinclair Weeks and Under Secretary for Transportation Louis Rothschild.

Rep. Prince Preston (D.-Ga.) protested that advance lists of the projects were disseminated by Republican National Committee to local Republicans so they could claim credit for obtaining them.

"Secretaries Weeks and Rothschild have clearly demonstrated their political contempt for members of Congress of the majority party by their conspiracy to claim credit for a program this Administration undertook to destroy," Preston complained. "In other words, they deny parenthood but are willing to adopt the child."

The tiff is not likely to end here. Preston is chairman of the Appropriations Subcommittee which handles funds for airport projects.

—Washington staff

Firing of 900-Mile Russian Missile Spurs

Speed-up order in work on anti-missile missile; Democrats blast Administration on defense policies.

By Robert Hotz

Washington — Repercussions from Russian test firings of a 900-mile-range ballistic missile are changing the scope and pace of the Defense Department guided missile development program. The Russian test firings have occurred at increasingly frequent intervals during the past six months and indicate that the missile is equipped with some form of guidance.

Existence of this Russian missile has been accepted as a fact by the Defense Department and National Security Council since last fall. First public acknowledgement of the Russian missile came from Sen. Stuart Symington (D.-Mo.) on a national television program when he stated:

"The Russians have tested-fired long-range ballistic missiles hundreds of miles farther than anything this country has ever tested."

The longest range ballistic missile yet test-fired in this country is the Army's Redstone, which has a range of about 200 miles—roughly equivalent to the German V-2's performance in 1945.

Confirmation by Ike?

President Eisenhower's recent public acknowledgement that the Russians are ahead of this country in some portions of the missile field was interpreted as veiled confirmation of the existence of the 900-mile Russian missile.

Since the existence of the Russian 900-mile missile was accepted in the Pentagon and by the National Security Council, the U. S. missile program has been changing in the following directions:

• **President Eisenhower has become** personally concerned about the relative progress of U. S. and Russian missile development. Three months ago he ordered monthly personal reports made to him on the missile program by Defense Secretary Charles E. Wilson and Maj. Gen. B. A. Schriever, commander of the Western Development Division of the Air Research and Development Command. The President now depends directly on these personal reports from Wilson and Schriever for his data on the missile program instead of on the normal channels through which information passes from the Pentagon to White House.

• **Convair's Atlas (SM-65)** program has been accelerated and a prototype Atlas is being built in a special portion of Convair's San Diego plant.

• **Second intercontinental ballistic** missile program has been organized, with the Glenn L. Martin Co. as the prime contractor. Martin is building a new plant in Denver for its Missile Division.

• **Intermediate range ballistic missile** program has been enlarged to include both an Air Force project (contracted to Douglas) and a joint Army-Navy effort based on the Army's Redstone project at Huntsville, Ala. However, there are signs that the Navy is not happy about the technical abilities of the former German Peenemuende V-2 rocket experts now heading the Army missile program at Huntsville and is making efforts to split off and run its own IRBM program.

• **Intensified interest** in the anti-ballistic-missile defensive missile. This program has emerged from the study phase into an active hardware development program. Army has jumped into the lead on this program with its development contract to Bell Laboratories. USAF anti-missile program is still in the study phase but is expected to shift rapidly into active development.

Basic decision on the missile program was made last November after existence of the Russian 900-mile missile was officially acknowledged. Instead of concentrating on the Atlas program that had been organized on a firm basis late in 1954, the Pentagon decided to broaden missile work by adding the second ICBM program and pushing an IRBM program for all three services.

It is on this decision to dilute the limited pool of technical facilities and scientific resources available in the ballistic missile field—instead of concentrating them on a single Manhattan project type of crash program—that the current military, political and scientific debate is concentrated.

J. E. DEMPSEY: Project engineer for accelerated Atlas missile program.

MAJ. GEN. B. A. SCHRIEVER: Personal reports to the President on missile program.

Critics of the broadened missile program cite the fact that both ICBM programs and both IRBM programs represent the same basic technical approach to the ballistic missile problem; all rely on the same sources of powerplants, on the same sources for the critical nose cone development and on the same basic pool of scientific talent.

History of Atlas

Proponents of the broadened missile program feel it is a mistake to concentrate all the long-range missile effort into a single program; that it is necessary to have several programs active in case one fails; and that inter-service rivalry makes it politically necessary to avoid a USAF monopoly on long-range missile development and operation.

There also is considerable argument in technical and military missile groups that it is basically wrong to start now to develop an intermediate-range missile (about 1,500 miles range) when the Russians are already close to this goal. Proponents of this view believe that the U. S. should concentrate all its available funds, facilities and scientific talent in an effort to beat the Russians to the intercontinental ballistic missile (5,000 mile range.).

The Atlas program has had a discouraging career in the Defense Department. It was rejected as a practical project by all of the top level Pentagon missile survey committees in the 1950-54 period. It rambled along on a less than a million-dollar annual budget until 1954.

U. S. Changes

Combination of a major scientific breakthrough in developing smaller packages for fusion-type nuclear warheads and revived USAF interest—spearheaded by Trevor Gardner, who recently resigned as Assistant USAF Secretary for Research and Development (AW Feb. 13, p. 28)—put the Atlas program on a firm basis by the end of 1954.

The smaller fusion-type warheads alleviated two major problems in ICBM development:

• **Area destruction possible** with the megaton yield of fusion warheads reduced the guidance system accuracy required to reach a predetermined target over a 5,000 mile range.

• **Reduced weight of the warhead payload** made possible major reduction in the power required to deliver the fusion-type explosive on target over a 5,000 mile range.

Sen. Symington Sparks Debate Over Airpower

By Katherine Johnsen

Washington—Sen. Stuart Symington (D.-Mo.) directly challenged President Eisenhower on the guided missile program, highlighting the running attack of Congressional Democrats on the administration's defense policies.

He stated flatly in a Senate speech that the U. S. is "behind (the Soviet Union) in the long-range ballistic missile field, the most important new weapon the world faces today."

Other developments:

• **Sen. Clinton Anderson** (D.-N. Mex.), chairman of the Joint Congressional Atomic Energy Committee publicly repeated the demands of Sen. Henry Jackson (D.-Wash.) for a "crash" program on guided missiles.

• **Disagreeing with Defense Secretary** Charles Wilson's plan to name a new "czar" of guided missiles and the proposal by others that a Manhattan Project type of program for guided missiles be established, Sen. Symington proposed instead that one of the service secretaries be given top authority over missiles. "A Manhattan Project setup would first take this new weapons system out of the services, and then, at some later date, be faced with the effort of working it back into the services, with all the attendant delays and misunderstandings," he said.

• **President Eisenhower was called upon** by Rep. Thomas Abernethy (D.-Miss.) to assume personal responsibility for guided missiles.

• **Rep. George Mahon** (D.-Tex.), chairman of the House Appropriations Subcommittee on the Armed Services, repeated his "great concern" over this country's guided missile position after hearing secret testimony from top Defense and Air Force officials, including Trevor Gardner.

SEN. STUART SYMINGTON: Direct challenge to Eisenhower; U. S. "behind" USSR in long-range ballistic missile development.

• **Sen. Alben Barkley** (D.-Ky.) pointed to the Cincinnati speech of Gen. Thomas D. White, USAF's Vice Chief of Staff, (see p. 31) as "confirming the protest of Mr. Gardner which resulted in his resignation."

Eisenhower Challenged

Following are statements made by President Eisenhower on the guided missile program at his press conference Feb. 8 (AW Feb. 13, p. 28) and Symington's challenge of these remarks:

Eisenhower: ". . . . One of the things you have to watch is this: don't try to develop too many at once or you get in each other's way, and you block them all, through the confusion . . . ."

Symington: "One of my chief concerns is that what the President says should not be done is exactly what is being done today.

"The missile development picture is being spread around to the point where concentration on the most important weapon of all, development of the long-range ground-to-ground missiles, is being sacrified so more people may have a finger in the new pie."

Eisenhower: "This thing is being researched and developed as rapidly as it can be done in this country so far as my experts and my people in the Defense Department tell me."

Symington: "But who is the expert? Is it the Assistant Secretary, Mr. Gardner, under whom the long-range missile program was being developed . . . .

"Or is it the Secretary of Defense, who, not so long ago expressed himself as believing the development of an atomic airplane was comparable to finding out why potatoes turned brown when fried?"

Eisenhower: ". . . . In certain fields, I am sure we are well ahead of the other side. In certain fields I think they are probably ahead of us. But those are limited fields in a great big field . . ."

Symington: "This might lead some to believe that our being ahead in some missiles and the Communists being ahead in others is nothing to worry about—sort of a balance.

"The facts are that our missile development may be ahead in the short-range area, but their missile development is ahead in the area that counts by far the most—the long-range area."

Eisenhower: ". . . . Overall, we have no reason to believe that we are not doing everything that human science and brains and resources can do to keep our position in proper posture."

Symington: "That is not correct. As of today, we are operating almost on a business-as-usual basis."

Symington also recalled that when he warned that the U. S. might be losing its air superiority a year ago, after the May Day display of aircraft in Moscow, the President declared the following day: "It just isn't true that the U. S. has lost in a twinkling all the great technical excellence and development of its airpower."

Cites White's Statement

Pointing to Gen. White's statement that "in airplane after airplane (the Soviets) are approaching us in quality and surpassing us in quantity," Symington declared:

"In other words, what I predicted last year is now being formally acknowledged by this Administration as only too true."

REP. GEORGE MAHON (D.-Tex.) chairman of House Appropriations Subcommittee: "Grave concern" over U. S. missile position.

Ramo-Wooldridge, ARDC Groups Act as Missile System Managers

Los Angeles—Western Development Division of the Air Research and Development Command, the Special Aircraft Project Office of Air Materiel Command and the Guided Missile Division of Ramo-Wooldridge Corp. act as an entity here to function as weapon system managers for the Air Force guided missile program.

Western Development Division is composed of about 100 USAF officers, commanded by Maj. B. A. Schriever. All but four or five of these USAF officers hold engineering degrees with a high percentage of masters degrees and a few Ph.Ds. They wear civilian clothes and occupy the same facilities as the Ramo-Wooldridge Corp. Guided Missile Division near Los Angeles International Airport.

Although Western Development Division is part of ARDC it has authority to operate independently on whatever missile programs are within its jurisdiction and does not require ARDC approval for its actions.

Special Aircraft Project Office holds a similar position within Air Materiel Command. It too can sign its own chits where official Government contracts are needed. It does not need AMC approval for its actions and it has authority to sign contracts with contractors for whatever hardware is considered necessary for the missile projects under Western Development Division jurisdiction.

Scientists Available

Ramo-Wooldridge Corp. Guided Missile Division provides a staff of technicians and scientists who are available to missile contractors for guidance and assistance in development of specific missile programs. Western Development Division's feeling is that the Ramo-Wooldridge staff's capabilities can be applied particularly where contractors are venturing into new fields and do not have their own staff or facilities to cope with new types of problems.

Ramo-Wooldridge Corp.'s position in Western Development Division and the USAF missile program has been a source of friction with aircraft firms holding missile contracts. The aircraft firms have been reluctant to divulge their technical data to Ramo-Wooldridge personnel on the grounds that the corporation is also a competitor in the missile and avionics fields.

Some major missile contractors feel ARDC is putting them at a competitive disadvantage in forcing them to pass on technical data to another firm that is also manufacturing the same type of equipment.

These three units—Western Development Division, Special Aircraft Projects Office and Ramo-Wooldridge's guided missile division—operate as a unified command, with WDD operating as weapons system manager, SAPO handling the contracts and Ramo-Wooldridge furnishing technical assistance and evaluation when needed.

Six-to-One Ratio

Within Western Development there is a ratio of about six technical people to one administrative officer. Among the technical people are specialists in weapon systems development, operational suitability and planning.

When Western Development Division was organized, ARDC looked around for an organization that had the scientific and technical staff to supplement the military management of the missile program. ARDC conducted a survey of potential suppliers of this type of talent and picked Ramo-Wooldridge's Guided Missile Division.

Overall, the trio of WD, SAPO, and Ramo-Wooldridge act as weapon system contractors to USAF headquarters. USAF tells them what it wants in the way of operational missiles. Western Development Division decides what form the necessary development will take. SAPO lets contracts for development of the necessary hardware and Ramo-Wooldridge does technical evaluation of contractor proposals, provides technical assistance and helps get the job done. This arrangement has evolved from Western Development Division's original function of simply riding herd on ARDC contracts on the West Coast.

Its first main set of contracts involved the Convair Atlas intercontinental ballistic missile program and was later extended to include the intermediate-range ballistic missile.

Ramo-Wooldridge Plans New Plant To Step Up Avionic Production

Los Angeles—In a move to establish itself as a major producer of avionic equipment, Ramo-Wooldridge Corp. last week announced plans for the construction of a full-scale manufacturing plant near Littleton, Colo., southeast of Denver. The plant will be located on a 640-acre site on which the company already had taken option (AW Jan. 16, p. 107).

The step, Ramo-Wooldridge officials hope, will balance the company research and development activity (its major field at the moment) with its full production capability. Its present facilities are engaged only in pilot-line production of avionic devices.

Ground for a 172,000-sq. ft. manufacturing building will be broken this spring. It probably will require another year-and-a-half for the structure to be completed, tooled up and ready for production.

The plant is laid out to expand in three directions, and the new building will occupy only a small portion of the 640 acres. There are no present plans, however, for additional buildings.

No specific articles are now planned for manufacture in the new facility, but original production generally will be avionic systems for the military, including aircraft fire control systems, radar systems, electronic computers and advanced communications equipment.

The company also wants its commercial manufacturing business to develop as quickly as possible, but it is unlikely that commercial products will be produced at the new plant during its early stages of operation. Later, Ramo-Wooldridge expects to produce automation and data processing equipment for commercial applications.

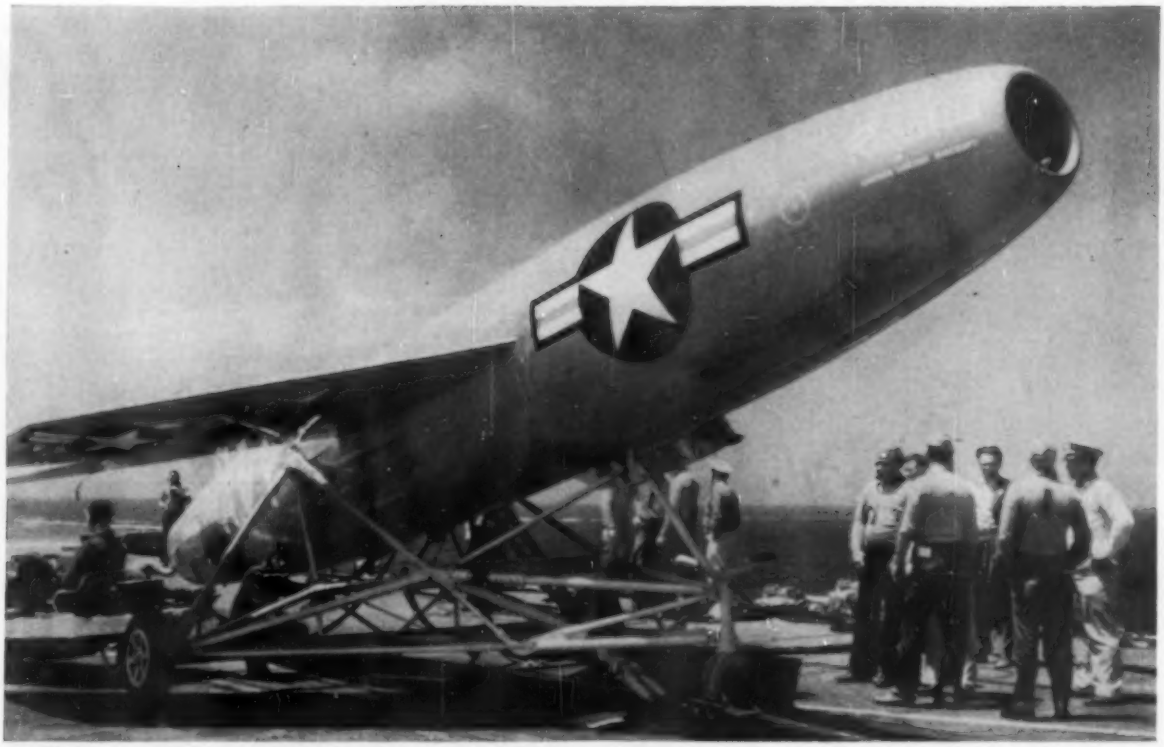
The plant, a one-story building, will include machine shops, a sheet metal shop, metal process facilities, extensive assembly lines, environmental test and inspection facilities, storerooms and office space.

If the full capacity of the new plant is used, about 1,500 people will be employed, with annual sales expected to run around $25 million.

Along with manufacturing personnel, there will be a need for at least a small permanent engineering staff at the new site. This force will be supplemented by members of the Los Angeles engineering staff.

In keeping with the Government's dispersal policy, Ramo-Wooldridge decided not to locate the new plant on the West Coast. Denver was selected because of its relatively convenient proximity to Los Angeles by air, an important consideration in providing the necessary close liaison between research and development and manufacturing.

Another reason for selection of the Denver site is that there are skills and talents available there for the type of manufacturing the company will do.



REGULUS, secured to lightweight dolly-launcher, is moved up to steam catapult for test firing from deck of the USS Hancock.

New Launcher Weds Regulus, Catapult

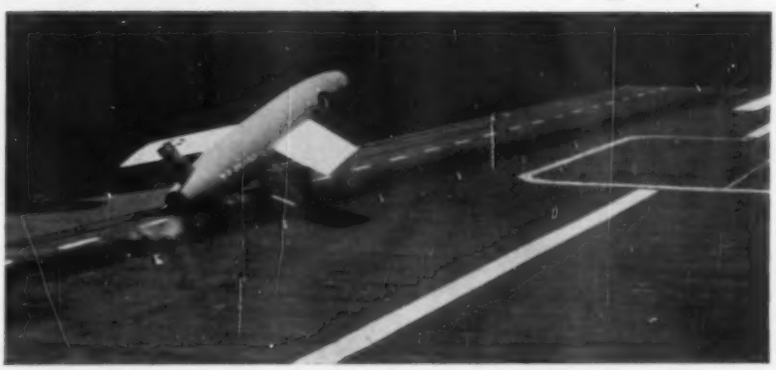
The seaworthiness and adaptability of the Chance Vought Regulus, Navy's first operational surface-to-surface guided missile, has been increased by the development of a lightweight launcher-dolly that permits catapult launchings and does away with the cumbersome equipment previously required.

The three-wheeled launcher, fabricated from steel tubing and shown in pictures above and right during tests aboard the USS Hancock, weighs just one-twentieth as much as the portable launching platform and Jato bottles required for earlier carrier launchings.

The missiles can be loaded aboard the launcher-dollies ashore and stowed on the carrier's hangar deck. When ready for use, the dolly is wheeled to the carrier deck and hooked up to the steam catapult, ready for launching. At the end of the catapult run, the Regulus takes to the air, and the launcher is jettisoned into the sea. Detail design on the cart was begun by Chance Vought last spring.

The design of the Regulus itself was first conceived by Chance Vought in 1947, and two versions eventually evolved—a recoverable test and training missile with a retractable landing gear and a non-recoverable tactical missile.

It has been launched successfully from the decks of cruisers, carriers and small surface ships, from shore launchers and from submarines.

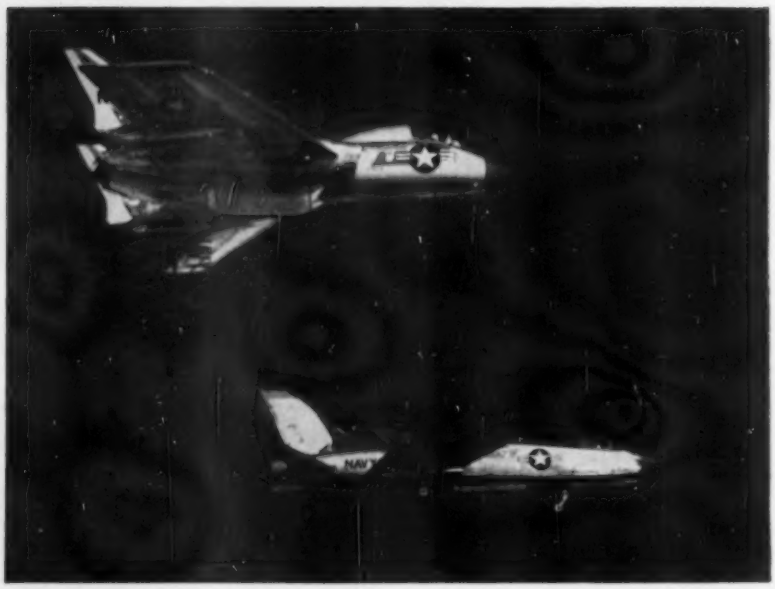


WITH STEAM licking up from the hidden catapult, Regulus and launcher begin their run.

NEARING END OF RUN, catapult prepares to launch Regulus and eject launcher into sea.

Vought's Team: The Old Meets the New

Chance Vought's new F8U Crusader (foreground above), which promises to become the Navy's frontline fighter, flies in formation with the earlier F7U Cutlass. The 1,000 mph.-plus Crusader is now in production at the Vought plant in Dallas and is scheduled to reach the fleet on an operational basis sometime next year. The Cutlass entered the fleet late last year after a long series of delays. At right, the F8U in background is forced to lower its landing gear to hold the formation. The Crusader is powered by a Pratt & Whitney J57-P-4 turbojet engine with afterburner; the Cutlass by two Westinghouse J46-WE-8 turbojets.



IBM Radar Bombing System for B-52s

The USAF's newest radar bombing and navigation system (the MA-2) for use on the Boeing B-52 was partially unveiled last week by International Business Machines Corp., producer of the system.

The system weighs 1,457 lb., occupies 30 cu. ft., and will cost approximately $300,000 (including installations costs) when it reaches the full-production stage.

The MA-2, called BRANE (Bombing Radar Navigation Equipment), is said to have "unprecedented reliability."

The contract for the system was awarded to IBM in 1951, about the time that the Air Force was experiencing considerable reliability problems with the K-bombing system used in the B-36 and B-47. This difficulty explains the emphasis on reliability in the MA-2 design.

The system employs a bombing radar system, developed and produced by Raytheon Manufacturing Co., together with an optical bombsight.

The bombing navigation computer employed by IBM is basically an analog-type device, although the system does employ "some digital pulse-counting techniques," a company spokesman said.

In answer to an AVIATION WEEK question, an IBM spokesman said the "system at the present time does not use inertial guidance techniques."

The MA-2 marks IBM's first entry into the field of complex airborne bombing systems, although the firm is a major supplier of digital computers for use in the air defense SAGE system.

The MA-2 bombing-navigation system is based on an original Air Force sponsored study contract with the Perkin-Elmer Co.

Douglas Announces Larger DC-8 Version

Douglas Aircraft Co. last week announced details of a larger, longer-range version of its DC-8 jet transport, some of which probably will be powered by Rolls-Royce Conway bypass engine.

The aircraft, which will be offered for both domestic and international use and apparently was designed to meet the challenge of Boeing's intercontinental version of the 707 (AW Dec. 12, p. 7), will have a normal cruising speed of 550 mph., a top cruising speed of 589 mph. and a maximum range of 6,720 statute miles.

Its wingspan has been increased five ft. to 139 ft., nine inches and its length by 100 inches to 148 ft., 10 inches.

Douglas said airline customers can choose their powerplants from among Pratt & Whitney's J57 and J75 and the Conway bypass.

Strongest Statement Yet:

White Warns of Red R&D, Production

Cincinnati—Soviet Russia not only is "making scientific and technological advances at a faster rate" than the United States, she also is "beating us at our own game—production," Gen. Thomas D. White, U. S. Air Force Vice Chief of Staff, said at the opening of General Electric Co's new jet engine facilities here.

Gen. White's speech was the sharpest warning yet from either a military or civilian leader on Russia's progress in the race for superior airpower. It came only a few days after USAF Secretary Donald Quarles spoke in Texas minimizing the importance of technological developments.

Gen. White said the Russians have:

- "**Halved our lead-time** on the heavy jet bomber."
- **Developed a "lead-time** considerably less than ours" on "all other aircraft."
- **Put not one but several** projects on a crash basis," indicating "a tremendous capacity for research and development."

To help meet this challenge, American industry must volunteer to do more research and development on its own, Gen. White said.

- **"Almost closed the airpower gap"** with "more than remarkable" progress in four areas where they once were at a disadvantage—"the Soviet war-ravaged economy right after World War II, their production base, their technology and the resources readily available to them."

Elusive R&D Dollar

"It is useless to debate whether or not their production engineering is as sophisticated as ours," Gen. White said. "The fact is that they have been and are outproducing us in all categories but medium bombers."

The speech delivered by Gen. White originally was written for USAF Chief of Staff Gen. Nathan F. Twining. Gen. White gave it when other commitments kept the Chief of Staff at his office in Washington.

Although Gen. White did not mention Russia's work on missiles, he dealt at length with research and development generally, pointing out that it is "a business in which failure is routine and success extraordinary."

"The taxpayer and the legislator quite understandably prefer to see our national income spent on success, not failure," he said. "This makes the research and development dollar hard to get."

This statement came shortly after Trevor Gardner, Assistant Secretary of the Air Force for Research and Development, resigned as the climax to his unsuccessful fight for more research and development funds (AW Feb. 13, p. 28).

GEN. THOMAS D. WHITE

Gardner's Fight Recalled

Although Gardner's fight with USAF Secretary Quarles and Defense Secretary Charles E. Wilson has been interpreted widely as a battle over funds for missile research, Gardner himself made it clear that he had sought funds for research in a wide variety of fields related to aerial weapon systems.

Gen. White limited specific comment on air weapons to the latest ones actually "in the Soviet arsenal." He said:

- **"They now have a swept-wing** heavy jet bomber, the Bison. In many respects it equals our new B-52, which is the best that American technology has yet been able to produce."
- **"They have a long-range turboprop** bomber, the Bear. The Bear is their longest-range airplane, comparable to our B-36. The B-36 is gradually moving into retirement."
- **"The Soviets also have a medium jet** bomber very similar to our B-47. We still have a big lead on them in medium jet bombers."
- **"They have several thousand fighters** which are better than our F-86s and F-84s. They also are producing newer fighters which compare to our F-100."

'Approaching in Quality'

"I could go on and on," Gen. White said. "In airplane after airplane they are approaching us in quality and surpassing us in quantity.

"During the last few decades, we Americans have had a talent in which we reigned supreme," he said. "I refer to our talent for production—mass production. When challenged by aggressors, we have always depended upon our mass production methods to bail us out.

"Here is the area of deep concern—the Soviets are presently beating us at our own game—production.

". . . Of course we can outproduce the Communists," Gen. White said. "There is no doubt about that. Our production potential is not the reason we are falling behind.

Reason for Lag

"One of the reasons that we are dropping behind is that the Communists are making scientific and technological advances at a faster rate than we are."

The fact that Russia "can put not one but several projects on a crash basis indicates a tremendous capacity for research and development," Gen. White said, but it also "indicates a disregard for cost and for safety factors, and a willingness to gamble."

The Russians "achieved their gains in weapons by exerting the iron rule of a ruthless dictatorship," Gen. White said—directing "bright young Soviets" into scientific and technical careers "by no choice of their own," making them build "trucks instead of automobiles, submarines instead of commercial vessels, bombers at the cost of refrigerators and radar instead of television."

"Every action and decision affecting research, development or production of **anything** is made by the dictatorship," he said. "By quotas, schedules, norms and plans, the Soviet government controls everything right down to the last nut and bolt."

'Everybody's Business'

To win the competition with the Soviet system, Gen. White said, "we must realize that the defense of this nation is everybody's business—not just our own government's. That is both the price and the privilege of democracy.

"The products of American capitalism—our great corporations—must accept, along with their comparative freedom of action, their share of our national responsibility to provide our own defense."

Force levels, numbers of aircraft and weapons "are necessarily decided by our political and military leaders," Gen. White said—and "no one could expect our private industries to seize the initiative in production."

Instead, he said, "our great corpora-

tions can best volunteer increased efforts to the area of research and development."

In addition to the fact that "the research and development dollar (is) hard to get," Gen. White listed these reasons why industry must devote ever increasing efforts to research:

• **"Research, especially basic research,** is best accomplished by unfettered initiative working in an environment of complete freedom. Governmental projects are accountable to too many people to be able to operate in a completely free environment."

• **"If our Government paid for,** and therefore controlled, all the research necessary to keep us ahead, there would be little difference between our Government and that of the Soviet Union. Private initiative would become stifled, as it is in Russia."

This, he said, leaves large corporations with three alternatives:

• **"They can sit back and wait** for Government research and development money to come their way. This would eventually allow the Communists to get so far ahead of us that our nation would lose its freedom of action."

• **"Our Government, in desperation** and emergency, could step in and control the research and development and all the other activities of our industries. This, of course, would be similar to the very way of our life we are trying to defend against."

• **"Our industries can roll** up their sleeves and pitch in even harder to add to governmental sponsored efforts to keep us ahead technologically. Only in this way can we keep the U. S. ahead in the air and able to prevent war by being able to win one.

"This leaves little choice," Gen. White said, and "our leading industries" are accepting the third alternative.

Even so, he said, "In my opinion, privately sponsored research and development is far from sufficient yet." Several companies, Gen. White said, are "making moves in the right direction—among them General Electric."

He said the "evidence of scientific ingenuity and progress" in GE's new jet engine facility and the research efforts of other companies are "the results of patriotism and good business."

"It is good business to survive," Gen. White said, "and I am convinced that our survival depends on our technological progress."

Renegotiation Denies Net Worth

Wahington—The Renegotiation Board has denied that return on net worth is a compelling factor in its decisions ordering defense industries to make refunds on Government contracts.

Although the announcement did not mention the aircraft industry or Boeing Airplane Co. specifically, it clearly was a reply to Boeing's contention that the Board placed too much emphasis on net worth (AW Jan. 23, p. 30). Boeing has appealed a Board determination that it must refund $9,822,340 as excess profit on 1952 earnings.

The Board declared it "does not regard any particular rate of return on net worth or capital employed as excessive per se.

It said it "does not attempt to equalize its determinations respecting the members of any given industry from the standpoint of return on net worth or capital employed, inasmuch as renegotiation obviously is not a rate-making process.

The Board does not place special emphasis on the net worth and capital employed factor as distinguished from the other statutory factors."

Boeing's Case

In the Boeing case, a company spokesman declared that return on net worth "was the controlling factor" in that case. He argued that it did not "measure reasonableness of the price."

To this, the Board replied:

"The Board desires to re-emphasize the fact that reasonable profits are determined in every case by an over-all evaluation of all the statutory factors, and not by the application of any fixed formula with respect to rate of profit on sales or rate of return on net worth or capital employed, or any other formula.

Government Assistance

"That is not to say, however, that the return on net worth can properly be ignored in an appropriate case."

The Board then declared that the relationship of profit to capital and net worth is "one of the considerations." It added that it realizes enough profit must be retained to provide an incentive for investment.

Turning closer to the aircraft industry, the statement then pointed to the regulations on contractors who receive financial assistance from the Government.

These say the policy is to give more favorable consideration to manufacturers who utilize their own financing, because when capital is supplied by the customer, the contractor's contribution tends to be that of management only.

Increased Returns

An example of this, the Board says, "is to be found in a case where an increase in Government-furnished facilities enables a contractor to achieve substantially expanded volume for defense purposes.

"In such a case there will often be a significant increase in contractor's rate of return on net worth over the immediately preceding years, which generally will evidence in a concrete way the effect of increased volume and increased Government assistance.

"Certainly the Board must consider this fact, together with all other relevant factors, in determining whether contractor's profit on the expanded renegotiable sales bears a reasonable relationship to the expanded volume."

SAC Still Reds' Major Deterrent, LeMay Says

Washington—The fact that the Communists have broken the American monopoly on long-range nuclear air power does not detract from the deterrent value of our own Strategic Air Command, in the opinion of its chief, USAF Gen. Curtis E. LeMay.

Gen. LeMay told a Washington audience that he does not expect an attack on the United States so long as his command can promise disaster to the enemy.

"As long as a potential aggressor is convinced of this," he said, "I do not think we have to worry about a major war. Our main job is to keep him convinced."

The Strategic Air Command commander made these three claims for his airmen:

• **They can find their targets with certainty.** By celestial navigation, they can fly to within 15 miles of any spot on earth and from there find their precise target by radar.

• **They can destroy a specific target.** On practice missions the target is not always a city but often a specific corner of a building.

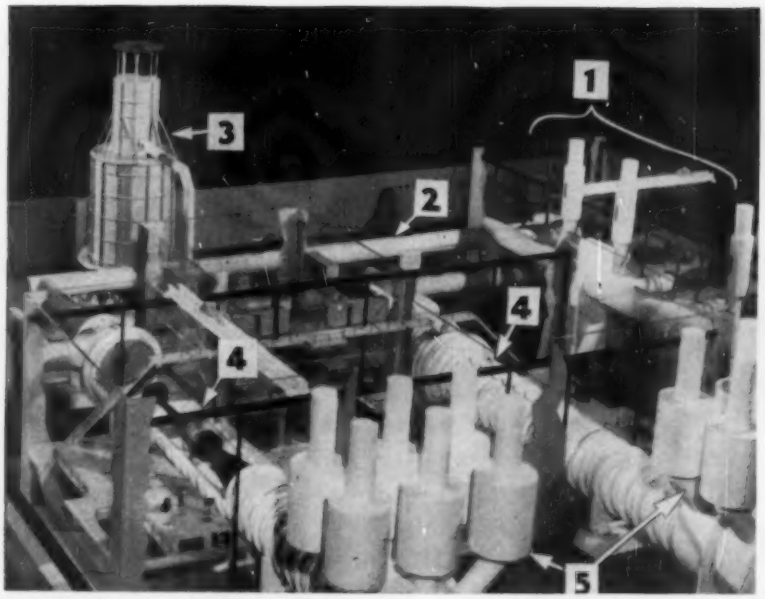
• **They can get home from the target** with odds at least as good as in World War II, when the losses were less than 2%.

If SAC's deterrent power fails to prevent an assault, Gen. LeMay declared, an instant and sustained counterpunch by his aircraft would knock out the foe's airpower.

This would include bases, bombers and fighters, weapons stockpiles, fuel supplies and possibly his entire industrial system.

The general emphasized that the "force-in-being" concept was forced on the U. S. by public opinion and recent scientific advances.

He said pilotless long-range bombers are coming, along with the guided missile, but until they are here SAC will depend on bombers and crews of the type in use today.



CUTAWAY model of General Electric's proposed altitude engine wind tunnel shows: (1) air supply powerplant, (2) air headers, (3) air heater, (4) two test sections and (5) test section exhaust silencer. The tunnel will be completed next year.

GE's Aircraft Turbine Division To Install Mach 3.5 Wind Tunnel

Cincinnati—General Electric's Aircraft Gas Turbine Division has announced plans to add a $20 million engine wind tunnel to facilities already valued at $100 million.

The new facility will test engines three times more powerful than the present 10,000-15,000 lb. thrust level at inlet conditions of Mach 3.5 and 60,000 ft. Construction is expected to begin early this spring and completion is scheduled for 1958.

Aside from the usual uses, General Electric feels the tunnel will:

- **Protect its advanced engine's** altitude performance guarantees.
- **Check the mechanical strength** of various engine components during altitude operation.

Flow Simulation

The wind tunnel will be made up of an 80,000 kilowatt powerplant driving section, an air pre-heater (or cooler) and two alternate test sections, each followed by exhaust silencers. The engine test sections will be altitude cells, 18 ft. in diameter. These will simulate the altitude pressures along the engine but not the flows.

The flows will be simulated at the engine inlets by a much smaller diameter nozzle, which will duct the supersonic flow to the engine's inlet. Or, more realistically the supersonic flow can be directed in special tests to the inlet of a particular aircraft's induction system. This will allow researchers to observe in a single test the effect of the duct upon the engine. On larger engines the ducting must be direct connected, but, on smaller engines, the test set-up may be of the semi free-jet type, where a gap is left between the end of the supersonic nozzle and the engine inlet.

Although the facility will not be large enough to fully simulate a podded engine flying supersonically at altitude, provision for variable nozzle throat and angle of approach to the engine inlet will allow GE to fly engines from sea-level to altitude and back and even air-start the engine (by windmilling) in case of altitude blow-out.

An important use of the cell, according to E. E. Stoeckly, manager of development facilities, is to permit GE to evaluate whether their engines are getting proper ducting from the airframe designer.

He denied, however, that General Electric had any intention of designing its own ducts.

Other Additions

Tentative future plans for the facility include adding a suction powerplant at the exhaust end of the system to increase its ability to do semi-free-jet testing, especially on the smaller engines.

Other additions to the Evendale (Cincinnati) development facilities, most of which have just been completed and were exhibited to the visiting military and airframe prospective customers, were:

- **IBM 704 digital computer** installation for paper analysis for advanced engine designs. The computing center is elaborately wired into direct hook-up with other GE plants for maximum utilization.
- **Magnetic tape data** reduction center for analysis of high-frequency phenomena, particularly blade and bucket vibration. GE apparently has developed skill in instrumenting and taking data off the rotating parts of their engines.

They accomplish this by delicate drilling operations to insert thermocouples and strain gauges which are wired to silver-graphite multiple slip rings, which, in turn, transmit the data to 28 channel tape recorders. By frequency analysis of the play-back data in its data reduction center, GE can pinpoint troublemakers among the compressor and turbine blading.

- **Electro-mechanical and hydraulic** section which develops engine controls in much the same manner in which airframe manufacturers have been developing flight controls. The section is planned around a central analog computing station equipped with Goodyear and Electronic Associates units. Actual control parts, sensors, amplifiers and actuators can be tied in with the centrally-located analog computer to run the GE-designed engine simulator (mainly a rotating mass to give rpm) and the engine "flown" from the computing center.

Missing control parts during early design stages can be simulated by the analog computer.

Thus, the whole controls part of the building can be wired into one building-wide "breadboarding" of the system under development and each group of engineers can see how their units are fitting into the desired dynamics of the complete system.

- **Major engine components** test section where air-flow up to 100 lbs. per second generated by a 27,000 hp. power station is used to create altitude or internal engine conditions in a series of compressor, turbine and combustion test facilities.
- **Materials laboratory** in which GE is working at solutions to the ever-present problems of how to get the metals and plastics (and the ways of fabricating them) which will allow the gas turbine to live up to its expectations.
- **Fuels laboratory** where GE claims it is independently developing some new high BTU per lb. fuels.

Little additional news of the GE powerplant for the Vanguard satellite project was officially released.

MODIFIED CH-1 helicopter with boundary-layer-control system on main rotors leads a Cessna 319A used in earlier boundary-layer studies.

Boundary-Layer-Control System For Helicopters Tested by Cessna

A boundary layer control system for helicopters that promises a substantial performance breakthrough for rotary wing aircraft has been successfully flight tested by Cessna Aircraft Co., Wichita, Kans.

The program, which involved a modified Cessna CH-1 helicopter, is the first successful application of boundary layer control to this class aircraft. It was the culmination of three years of study by the Air Branch, Office of Naval Research, and the Army's Transportation Corps.

Cessna officials refused to comment on the performance gains recorded during the trials except to say that "all concerned were extremely pleased with the results." It is believed that the CH-1, certificated by Civil Aeronautics Administration for a top speed of 122 mph., achieved considerably higher speeds with the boundary layer control system in action.

First flight by the modified CH-1 was made last June 30 at Wichita, and this phase of test program was concluded last month. It involved several flights to 10,000 ft. Cessna said that the Office of Naval Research chose the CH-1 because of its high installed horsepower and aerodynamic cleanliness.

Delays Blade Stall

Basically the system is designed to delay the onset of retreating rotor blade stall which has been a major factor in achieving high forward speeds in helicopters.

Use of boundary layer control permits the retreating blades to attain higher lift coefficients at higher than normal speeds.

Developed by Cessna as a result of wind tunnel trials at the University of Wichita, the system installed in the CH-1 test vehicle has an air pump installed in the right front seat in the cabin acting as an exhauster. The pump sucks air into the copter blades through slots in the upper rotor surfaces, through the blade interior to the airtight hub where a combination cycling valve and transfer chamber permits entrance of the air into the exhauster from which it is vented overboard on the left side of the copter just behind the cabin door.

Boundary Layer Operation

The cycling valve applies suction to the blade slots only over that portion of the rotor azimuth where blade stall is likely to occur.

The exhauster receives its power by means of a pulley on the drive shaft of the CH-1's 260-hp. Continental FS-O470-A engine. The drive shaft connects a Gilmer timing belt and a driven pulley incorporating a hydraulically actuated clutch. The pilot can engage or disengage the boundary layer control system in flight at will by means of a valve in the cockpit.

The special main rotor blades were designed and built by Prewitt Aircraft Co., Clifton Heights, Pa. They consist of steel-D-sections comprising the leading edges with bonded honeycomb sections forming the top and bottom surfaces of the airfoil afterbody.

Cessna's previous experience with boundary layer control has been with fixed wing aircraft. Several years ago it installed a sucking air system in a modified L-19 liaison plane which incorporated two axial-flow fans in the wings.

Profit Probe Aim: 'Total Picture'

Washington—The House Armed Services Investigating Subcommittee's hearings on aircraft industry profits will give "the total picture of all procurement for the Navy and Air Force" and "the total picture of industry," and will not be "a partial inquiry," Chairman Edward Hebert (D.-La.) has assured.

"There has for some time been an element of mystery about this subject simply because the whole story has not been told," Rep. Hebert said.

"There has been suggestion of excessive profits, of unfortunate or inopportune contracts; there have been failures ascribed to a multiplicity of things. But failures must be measured against the successes."

President J. L. Atwood of North American Aviation, Inc., the first witness, agreed that "insofar as security requirements permit, the American people should have the facts about military procurement at all times." He said he hoped his company could "contribute in a constructive way."

Rep. Hebert stressed that the hearings are "not a punitive expedition." He said the objective is to "consider the total picture as it is disclosed by the companies from their own books and by their own officials."

Glenn L. Martin Co. was scheduled to be the second of the 15 major airframe manufacturers asked to testify. The investigation is covering cost figures, profits and production schedules from 1952 to August of 1955. The Renegotiation Board has reviewed contracts covering earlier periods.

Rep. Hebert said the subcommittee does not "intend by suggestion or inuendo to indicate from our inquiry that there has been any wrongdoing, nor by the order of appearance of the companies, that any company is the target of the subcommittee's inquiry."

Picture Credits
27—Wide World

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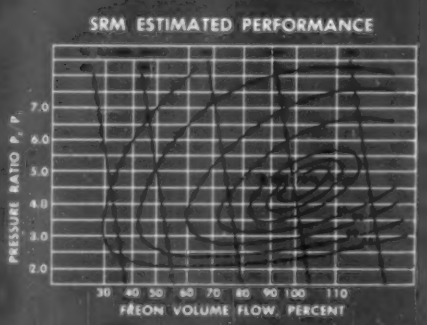
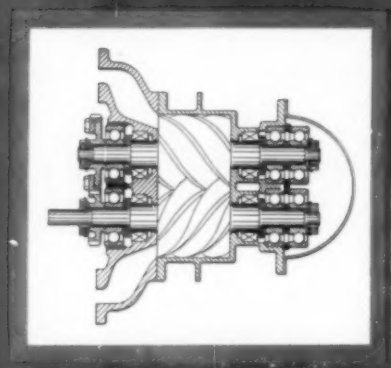
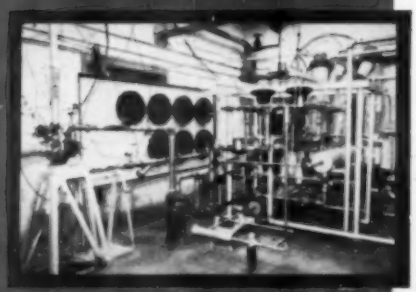


Performance Map Shows Compressor's Efficiency

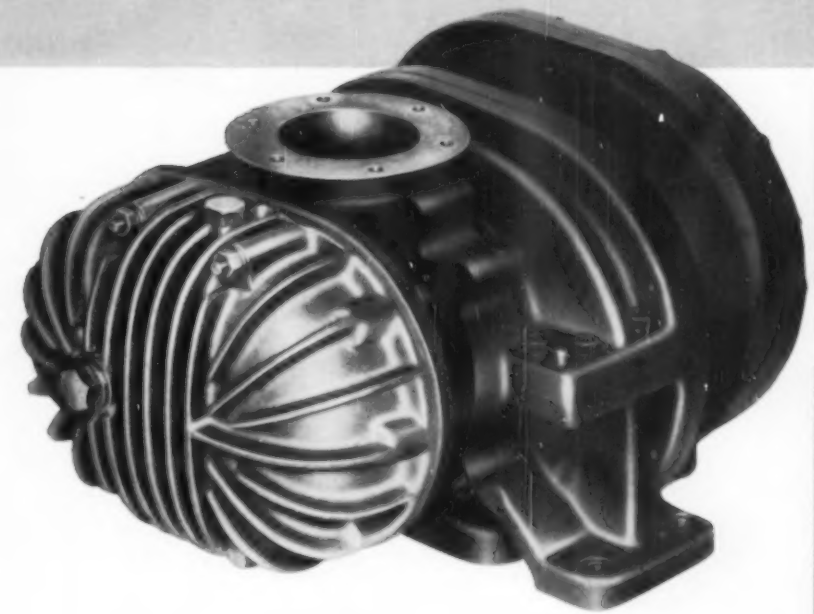


Cutaway View Showing Compression Principle



Installation in Stratos Freon Refrigeration Test Cell

Weight.....7 lbs.
Nom. 10-ton Compressor



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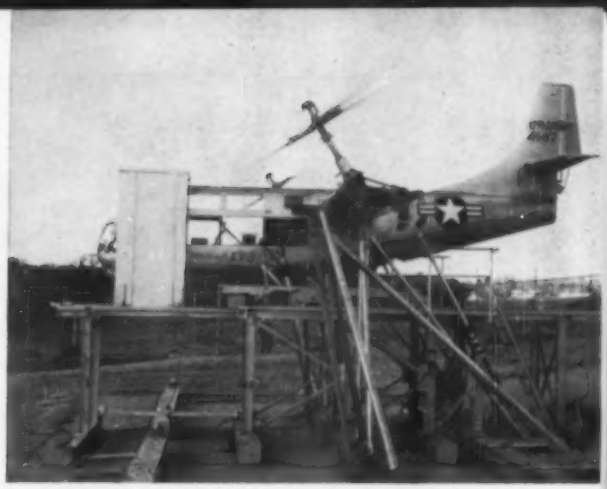
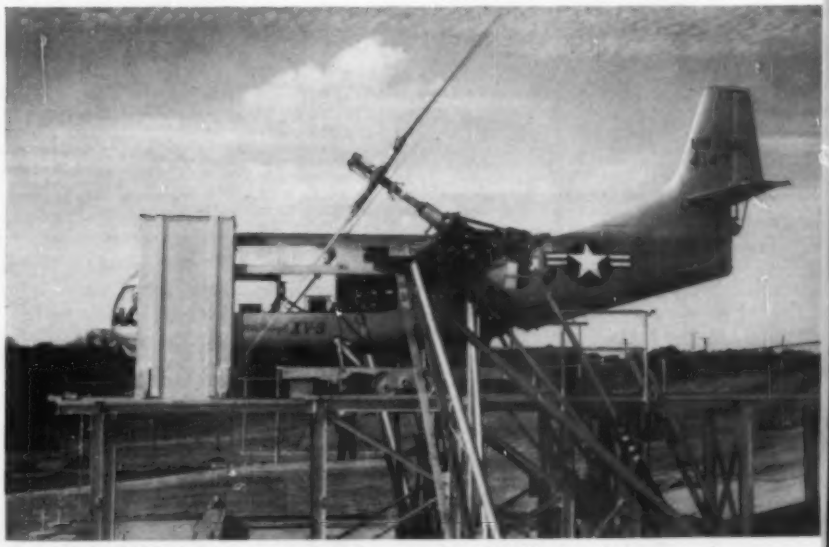


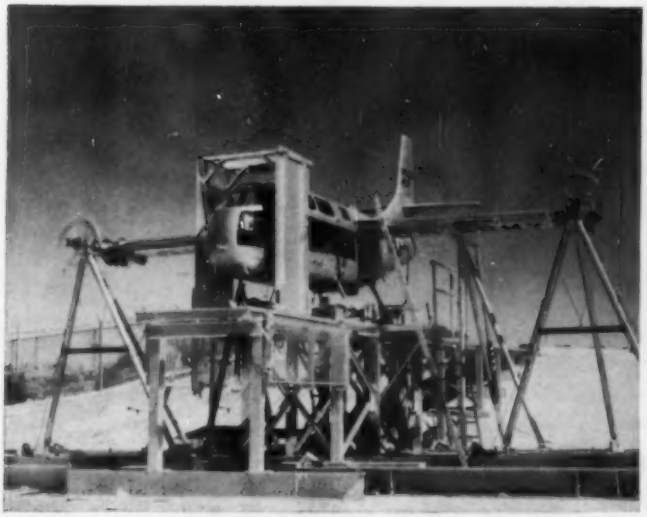
CONVERSION TEST begins (left) with rotors in vertical takeoff position. At right, rotors swing forward in move to horizontal.

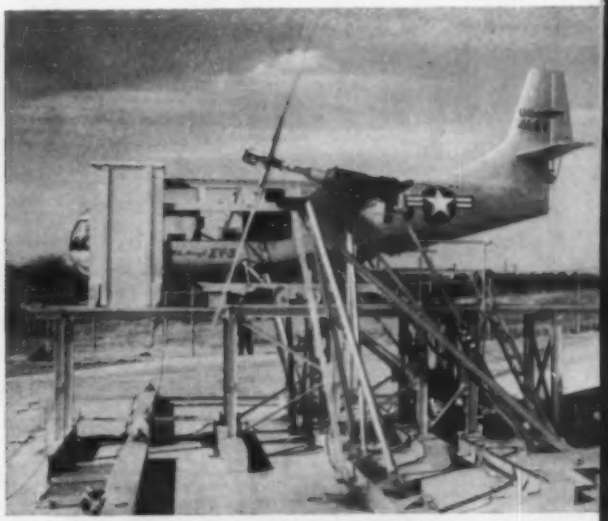
XV-3 Converts In Ground Test

Bell's XV-3 rotor-type convertiplane has successfully completed tie-down test stand conversions from helicopter to fixed-wing configuration and back again up through the maximum rpm. range. Sequence photographs beginning at top left show a typical test run. Other component testing and landing-gear drop tests have been performed since the Army convertiplane completed its helicopter flight test last summer (AW Aug. 29, p. 12) at Bell Aircraft Corp.'s Texas Division in Fort Worth.



TILTING ROTORS of XV-3 approach 45-degree angle and halfway mark in conversion.





ROTORS, at right, near end of transition from vertical to horizontal. At left, the XV-3 as it will appear in horizontal flight.

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First U.S. Bi-Directional System Will Begin Operation in November

By Glenn Garrison

New York—The nation's first bi-directional instrument runway is scheduled to be in operation at New York International Airport by the end of November, according to the Civil Aeronautics Administration.

Installation of an Instrument Landing System at the northeast end of Idlewild's Runway 4-22 will begin in early summer, and a second approach light system subsequently will be added to the ILS.

Equipping both ends of the runway with ILS will improve the airport's IFR landing capacity and, by reducing the need for circling approaches, should also ease the airport noise problem. In 1955, bi-directional instrumentation for Idlewild's instrument runway would have allowed an estimated 1,350 landings that were not made possible by the single ILS.

Although New York International will be the first to receive additional ILS, Newark Airport's installation will begin shortly afterwards if CAA budget plans permit. LaGuardia, third airport in the New York regional system, may have a bi-directional instrument runway eventually, but its prospects now seem obscure. (CAA officially will discuss only the Idlewild installation, the only one mentioned in the present budget.)

Second ILS Criteria

All three New York airports meet the criteria for second ILS consideration set by CAA Airway Planning Standard No. 1, which requires "that the velocity and direction of low visibility winds are such that a second ILS would permit 700 or more annual instrument approaches which otherwise could not have been made." Among them, the New York airports could have accommodated almost 5,000 additional IFR landings in 1955 by using bi-directional approaches, according to Port of New York Authority estimates.

The efforts to acquire second ILS installations in the New York complex began in 1951, after the CAA's First Region and the Port Authority completed a joint study of air traffic flow through New York. Both agencies agreed that the installations were desirable. It was then up to the Port Authority, as operator of the airports, to prod the First Region to recommend the installations and to pry loose needed funds.

From CAA's standpoint, there were other problems, too, that had to be solved before bi-directional approaches could be established.

At New York International, for example, CAA delayed action pending developments in a second instrument runway project planned at that airport. CAA wanted to wait and install the new ILS at the northeast end of the proposed runway, which will be parallel to and near the existing 4-22.

At the moment, however, since the second runway seems not to be an immediate prospect, the second ILS will be used for existing Runway 22 and will be moved over when the new runway is built.

Reduced Minimums

Present landing minimums at Idlewild are 200 feet and one-half mile for the southwest approach to 4-22, and 400 feet and one mile for the northeast approach, using the "back course" of the present ILS (which excludes the glide path and approach lights). With the new ILS, minimums will be 200 feet and half a mile for either approach.

The Port Authority already had acquired the necessary land for the new ILS installation.

Uncertainty about an obstruction in the northeast approach to Runway 4-22 at Newark has been a "key obstacle," in CAA's view, to recommending a second ILS at that airport.

The 288-foot-high "Calco Stack" has obstructed the approach since 4-22 was opened in 1952, and its removal was delayed by long negotiations with the cobalt blue manufacturer using the site. Lowering the industrial smokestack would have created a health hazard, while leaving it up prevented even the use of circling approaches from the northeast at Newark. Hence, minimums are 200-one half at the southwest end, 500-one and a half from the northeast.

Last week, however, workmen removed the first brick from the stack, and it should be down within the next two months. The Port Authority, with anticipated federal aid, is paying $90,000 for the removal job.

That problem solved, CAA's First Region has recommended the ILS installation to Washington, but national CAA won't say whether there is an item for it in the coming budget.

LaGuardia Approach Problems

The LaGuardia instrument approach situation is knotty. The southwest, or instrumented, end of Runway 4-22 (the instrument runways at all three airports are parallel to one other in the

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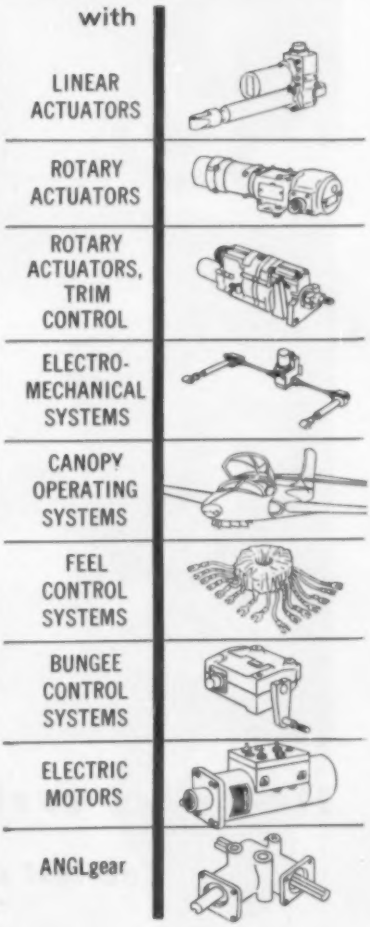

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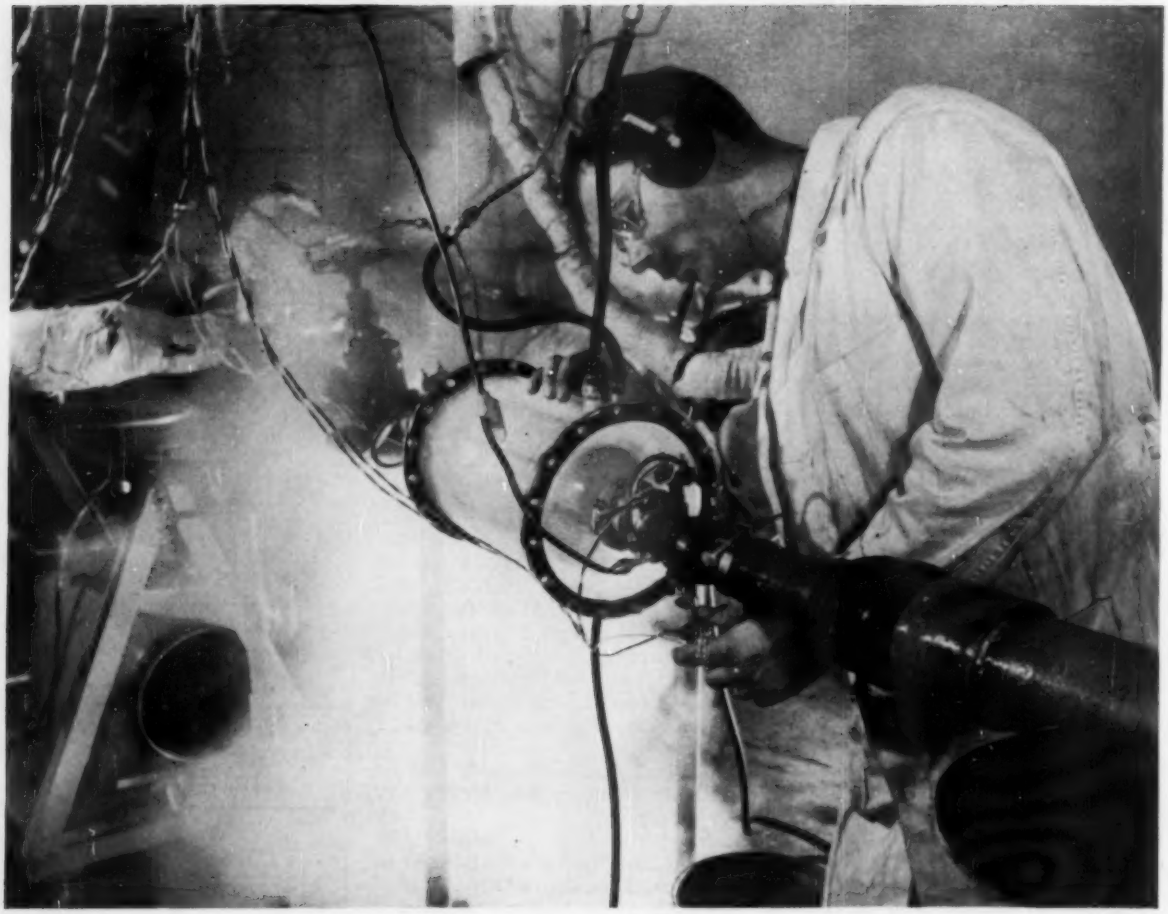

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interest of regional traffic flow) is obstructed, and its minimums are 400-three quarters, only slightly better than the 400-one for the northeast overwater approach.

Installation of a northeast ILS at LaGuardia would mean running the system out into Rikers Island Channel, a passageway for a very few ships each week but a hazard which would preclude lowering the minimums to any appreciable degree, even with an ILS in operation. The channel would have to be relocated if a full-length approach light system were installed out from the runway.

More Landings

Actually, second ILS aside, the Port Authority wants CAA to begin immediate installation of 1,000 feet of approach lights—as far out as can be gone without hitting the channel—to improve the operating conditions along this approach (AW Dec. 12, p. 83). But CAA won't approve this substandard (by 500 feet) installation.

As for the second ILS, the CAA wants a firm solution to the channel problem (relocation or otherwise) from the Port Authority before any further action is considered.

It seems quite possible, therefore, that two of the airports will be making use of bi-directional instrument approach systems within the next two years but that the third airport will do without for quite a while.

If all three airports are equipped with them by 1965, the new ILS's will allow an estimated 6,000 landings during that year that otherwise wouldn't be made.

U.S. Civil Aircraft Near 58,000 Mark

Washington—The number of active civil aircraft in the United States now totals 57,939, according to the Civil Aeronautics Administration.

CAA has prepared a new publication, "Active U.S. Civil Aircraft by State and County," which shows the states with the most airplanes are California, 6,311; Texas, 4,487; Illinois, 3,487; New York, 2,926; and Ohio, 2,836. For the country as a whole, there is an average of one plane to every 2,601 persons.

The ratio of planes to population is greatest in the six mountain states—Nevada, Montana, Wyoming, Idaho, Arizona and New Mexico—and in the four plains states, South Dakota, North Dakota, Nebraska and Kansas. Grant County, Neb., has the distinction of having more planes in relation to population than any other county in the U.S. There are 29 aircraft and 1,057 people, or one plane to every 36 persons.

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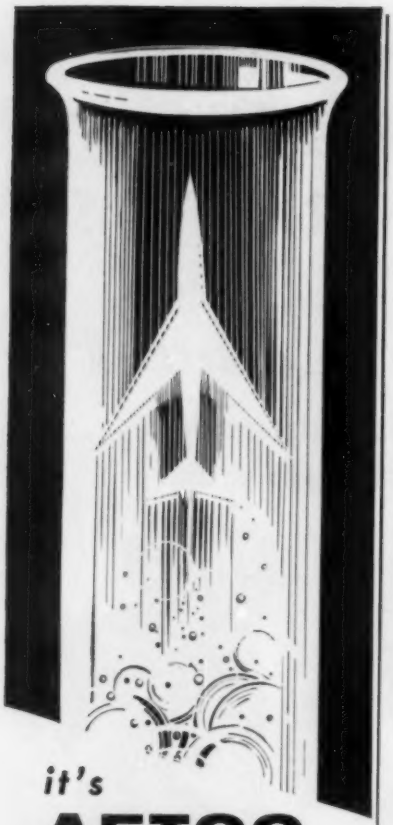

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Airborne Warning Signal for Helicopters

Development of a marker light for helicopters, shown installed on the tail boom (arrow) of a Hiller H-12B, rounds out the line of Madsen lights being made by Aircraft Engineering & Maintenance Co., Oakland, Calif. (AW Aug. 8, p. 29). Previous developments were for large aircraft and lightplanes. The system consists of two condenser-discharge bulbs which flash in rapid sequence, giving a "dash" signal. According to Andrew Madsen, the company's research director, the lights will quickly make known the presence of a helicopter in the airspace, without study by other pilots in the area. They are said to be readily apparent against ground lighting at night, to be effective in smog and haze and to have considerable range during daylight. The equipment weighs 5 lb., consumes 4 amp. at 24 v., provides a flash of 140,000 beam candlepower. Bulb life is said to be more than 1,000 hr.

Stock Transactions

Washington—Acquisition of common shares by two officers of Seaboard and Western Airlines is reported by the Securities and Exchange Commission for the period from Dec. 11 through Jan. 9. Arthur V. Norden, officer, acquired 26,950 shares, 25,250 through an exercise of option, making a holding of 60,745. Raymond A. Norden, officer and director, acquired 25,750 shares through exercise of option, making a holding of 61,494. Charles B. Ripley, director, disposed of 1,000 common shares, leaving a holding of 26,600.

Other recent transactions include:

Air Associates Inc. Acquisition of 200 common shares by C. Kenneth Baxter, director, making a holding of 4,200; acquisition of 625 shares of 6% convertible preferred by J. E. Ashman, officer and director, making a holding of 725.

American Airlines Inc. Disposal of 500 common shares by P. G. Larie, officer, leaving a holding of 2,000.

Avco Manufacturing Corp. Disposal of 5,000 common shares by W. A. Mogensen, director, leaving a holding of 6,000.

Bell Aircraft Corp. Disposal of his total holding of 150 common shares by J. F. Atkins, officer; acquisition of 200 common shares by Harvey Gaylord, officer, making a holding of 1,000; disposal of 400 common shares by William G. Gisel, officer, leaving a holding of 300.

Bellanca Aircraft Corp. Disposal of 62,414 common shares by L. Albert and Son, beneficial owner, leaving a holding of 1,008,836.

Bendix Aviation Corp. Acquisition of 200 common shares by Edward K. Foster, officer, making a holding of 630.

California Eastern Aviation Inc. Acquisition of 2,075 capital shares by J. W. M. Haight, officer and director, making a holding of 7,875.

Capital Airlines Inc. Acquisition of 1,308 common shares through conversion by James W. Austin, officer, making a holding of 13,059; acquisition of 200 common shares by Harold Byron Smith, officer, making a holding of 1,278; disposal of his total holding of $42,000 of 15 year convertible debentures through conversion by James W. Austin, officer, his total holding.

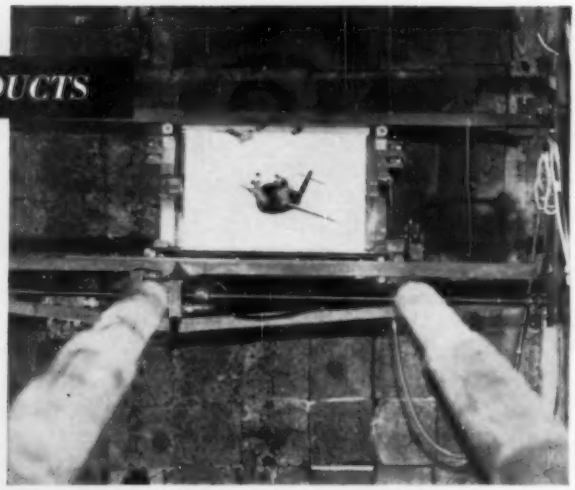
Colonial Airlines Inc. Disposal of his total holding of 100 common shares by Edmond M. Hanraha, director.

Continental Air Lines. Acquisition of 100 common shares by Charles H. Calhoun, officer, making a holding of 200; acquisition of 500 common shares by Joseph A. Uhl, officer and director, making a holding of 2,817.

Eastern Air Lines Inc. Acquisition of 400

This is the newest Honeywell fuel gage. Completely transistorized, it's smaller, more reliable, and as light as 0.8 pound per system. And like Honeywell's pioneer electron-tube gage, it's so accurate it measures any fuel load to within two-tenths of one percent. Honeywell's fuel measurement systems are specified for more than 120 different models of aircraft.

AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL



Problem: To cut armament system development time

Solution: New G-E DYNAT reduces need for flight test.

DYNAT—that's the name General Electric gives to its new Dynamic Accuracy Tester which can now evaluate complete airborne armament systems during ground firing under fully simulated flight conditions.

Combat readiness of airborne armament systems can be evaluated only by complete testing; so extensive flight tests are necessary to duplicate actual armament system environmental conditions. This procedure is expensive, time consuming and gives only a sampling of a system's performance. DYNAT solves this testing problem by simulating on the ground the situations expected in aerial combat. In this way Dynat saves time and money and gives a complete evaluation under all conditions required for combat readiness.

General Electric believes it has the answer to this problem with DYNAT; here's why:

1. Simulates air battles on the ground
DYNAT can be used for complete armament system and component evaluation. It tests the actual radar tracking and actual gun firing errors while the computing system is functioning. It consists of a group of units designed to simulate the duel conditions and provide continuous evaluation records of the problems that an armament system meets during the actual duels.

2. Tests effects of own ship's motion
DYNAT tests the ability of the armament system to compensate for its own ship's motion.

3. Radar noise
DYNAT can test the effects of radar noise, either atmospheric, system, or target generated.

4. Shock and vibration testing
DYNAT can test the effects of ship's vibration, shock, and any other circuit noise that might be encountered in actual flight firing.

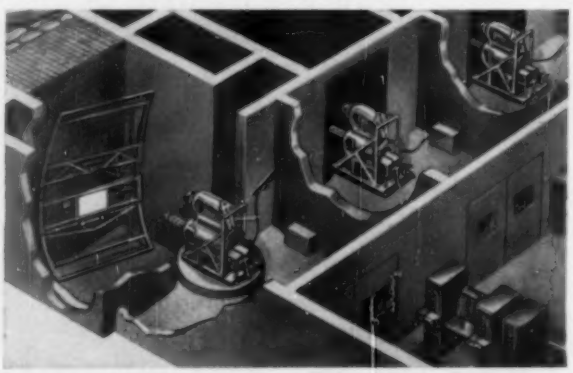
5. Windload effects
Windload conditions on the armament system with DYNAT can be simulated with weights and shock cords such that the proper load is applied to the weapon for a given angle of firing and condition of flight.

6. Complete environmental testing
Installation of DYNAT in G.E.'s all-angle firing lane permits full firing evaluation at any temperature from −100 F to +160 F.

DYNAT SIMULATES ACTUAL FLIGHT.
Every flight condition can be simulated by DYNAT. The fire control system tracks, computes, and *fires* in an environment which closely approximates its operational habitat; the effect on the armament system can then be evaluated through DYNAT. DYNAT results can then be checked airborne by flying only a fraction of the flights required on present full-scale airborne tests. The fact that DYNAT can simulate actual flight tests relatively quickly and inexpensively will permit the accumulation of statistical data from a far greater number of simulated air-duel courses than is normally possible in actual flight testing.

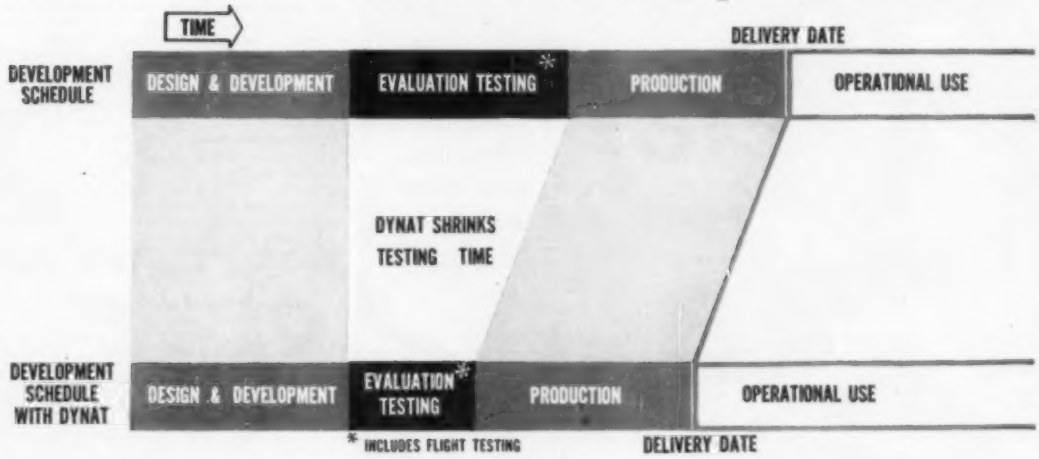
For more information on DYNAT, contact your nearest G-E Apparatus Sales representative, or write for bulletin GEA-6345, General Electric Company, Section 210-99, 1 River Road, Schenectady, N. Y.

DYNAT control console records both correct answers to attack problem and armament system's computed solution.



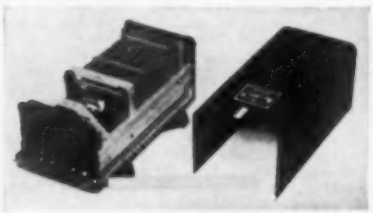
Foreground shows General Electric's all-angle firing lane with DYNAT installed. Console is in outer control room.

Here's how DYNAT reduces over-all development schedule



DYNAT's ability to reduce evaluation testing time will help to get operational systems in service sooner.

G-E Transformer-Rectifier operates at higher ambient temperatures



Weight of new unit is only 23.5 lbs.

General Electric's latest addition to a new line of transformer-rectifiers is model 6RS705F2. Weighing only 23.5 pounds, it actually betters the demands of MIL-P-7212 requirements. It can operate without de-rating up to 60,000 ft. at 20 C, or at sea level up to 110 C. A 5 KW unregulated unit for use in missile applications has also been developed, weighing 32.5 lbs. and a new design of a 12 amp. (4½ lbs.) unit has been completed.

OTHER DESIGNS AVAILABLE.

Many designs are available along with application engineering services on new and very special units, including units without built-in cooling means which can be utilized with blast cooling furnished. Silver-zinc battery charging tests have been made on the 200 amp regulated units, and test reports are available on request.

Latest G-E developments indicate that an 18 lb., 100 amp unregulated unit is now possible (MIL-P-7212), and a 55 lb., 200 amp regulated unit is in the immediate future. To reduce weight of regulated units, new circuit develöpments are being investigated such as the use of zener diode reference circuits and ampliformers. Use of Silicon broad area rectifiers is under study.

General Electric has done pioneer work in reducing size and weight of regulated and unregulated airborne power supplies. Check your nearest G-E Apparatus Sales representative for further information, or write for bulletin GEA-6443, Section 210-99, General Electric Co., Schenectady 5, New York.

New servo motor operating on B-47

Developed as part of a servo mechanism in the gun directional computer system for the B-47, General Electric's new miniature d-c aircraft motor is but 1¾ inches in diameter. Weighing 8 ounces, it operates equally well at sea level or at 50,000 ft. provided the ambient at altitude is at the lower end of the temperature range as stated in the general motor specifications.

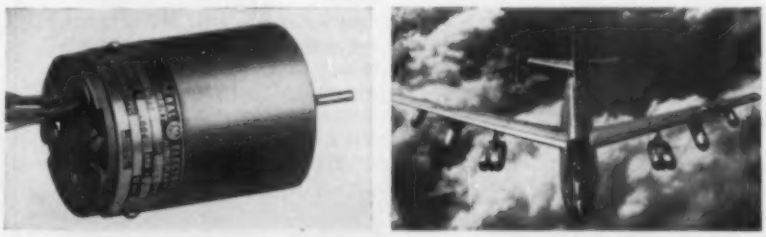
DESIGNED FOR THESE APPLICATIONS

The new motor is designed to meet the intent of the military specification MIL-M-8609 (ASG), and the extreme environmental conditions of this spec for short periods of time. It can be used as a prime mover in a gun directional computer system, in electronic devices, and can be modified for other aircraft and missile applications requiring a reversible motor capable of giving a high speed of response. It can also be geared to very low speeds where applications dictate.

NEW MOTOR HAS THESE FEATURES

Rated at 0.002 hp at 6500 rpm, the new, miniature d-c motor is built with Nicalloy punchings and pole pieces to meet the rigid humidity requirements given in the specifications. It is not restricted to any one type of operation, but has the advantage of a small time constant and good efficiencies in applications where small power outputs are required.

For further information on this new motor check your nearest G-E Apparatus Sales representative or write for bulletin GEA-6314, Section 210-99, General Electric Co., Schenectady, New York.



G-E servo motor is used in B-47 gun directional computer system.

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for Navigation and Communications Systems

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- Direction Finder Set AN/TRD-9
- Radio Receiving Set AN/TRR-7
- Radio Direction Finder AN/CRD-6
- Radio Transmitting Set AN/TRT-3
- Air Traffic Control Central AN/MRN-14 (XW-1)
- Radar Set AN/FPN-16
- Radio Set AN/TRC-32
- Air Traffic Control Central AN/MRN-12

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common shares by W. L. Morrisette Jr., officer, making a holding of 450.

Electronics Corp. of America. Acquisition of 100 common shares by John F. Rich, director, making a holding of 1,000.

Emerson Electric Mfg. Co. Acquisition of 5,000 common shares by Mills, Inc., beneficial owner, making a holding of 117,000.

Fairchild Engine & Airplane Corp. Acquisition of 270 common shares by Frank R. Nichols, director, making a holding of 3,000.

Flying Tiger Line Inc. Disposal of his total holding of 100 common shares by George T. Cussen, officer; acquisition of 1,500 and disposal of 1,500 common shares by Robert W. Prescott, officer and director, leaving a holding of 2,528; disposal of $5,000 of 5¼% convertible debentures by William E. Bartling, officer, leaving a holding of $70,000.

General Dynamics Corp. Acquisition of 658 common shares through exercise of option by Joseph T. McNarney, officer and director, making a holding of 1,000; acquisition of 1,000 common shares through exercise of option by J. V. Naish, director, making a holding of 1,200; acquisition of 1,000 common shares by O. Pomeroy Robinson Jr., officer and director, making a holding of 5,448.

Hoffman Electronics. Disposal of 500 common shares by Willard W. Keith, director, leaving a holding of 400.

Lear Inc. Acquisition of 5,000 common shares through exercise of option by Philip E. Golde, officer, making a holding of 12,609.

Lockheed Aircraft Corp. Disposal of 600 common shares by Willard W. Keith, director, leaving a holding of 400.

Glenn L. Martin Co. Disposal of 1,500 common shares by Daniel W. Siemon, officer, leaving a holding of 2,542; disposal of 1,100 common shares by Jess W. Sweetser, officer, leaving a holding of 6,355; disposal of 1,500 common shares by J. B. Wharton, officer, leaving a holding of 19,800.

Minneapolis-Honeywell Regulator Co. Acquisition of 200 common shares by Gerry E. Morse, officer, making a holding of 500; acquisition of 400 common shares by Alfred M. Wilson, officer and director, making a direct holding of 3,419 and an indirect holding of 400; disposal of 1,900 common shares by John J. Wilson, officer and director, leaving a holding of 90,900.

National Airlines Inc. Acquisition of 100 common shares by Edwin C. McDonald, director, making a holding of 600.

National Aviation Corp. Acquisition of 100 common shares by John G. Pennypacker, director, making a holding of 100; acquisition of 300 common shares by Frederick F. Robinson, officer, making a holding of 500 disposal of her total holding of 300 common shares by Marjorie E. Tindall, officer, disposal of 200 common shares by Elmer Wellin, director, leaving a holding of 5,300.

North American Aviation. Disposal of 500 capital shares by James H. Kindelberger, director, leaving a holding of 1,250.

Northrop Aircraft Co. Acquisition of 1,452 common shares through exercise of option by R. J. Pagen, officer and director, making a holding of 2,904; acquisition of 1,320 common shares through exercise of option by Edgar Schmued, officer, making a holding of 1,780.

Northwest Airlines, Inc. Disposal of 1,500 common shares by Croil Hunter, director, leaving a holding of 9,000; disposal of his total holding of common shares by Albert F. Tegen, director.

Pan American World Airways Inc. Acquisition of 500 capital shares through exercise of option by Russell B. Adams, officer, making a holding of 1,540; acquisition of 500 capital shares through exercise of option by Henry H. Berke, officer, making a holding of 2,005; acquisition of 1,500 capital shares through exercise of option by Willis G. Lipscomb, officer, making a holding of 6,408; acquisition of 312 capital shares through exercise of option by H. Preston Morris, officer, making a holding of 1,998; acquisition of 875 capital shares through exercise of option by John S. Woodbridge, officer, making a holding of 2,421; acqui-

sition of 1,250 capital shares by Clarence M. Young, officer, making a holding of 3,391.

Piper Aircraft Corp. Acquisition of 400 common shares by Howard Piper, officer and director, making a direct holding of 1,200 and an indirect holding of 31,400.

Radio Corp. of America. Acquisition of 100 common shares by Elmer W. Engstrom, officer and director, making a holding of 700; acquisition of 100 common shares by E. Dorsey Foster, officer, making a holding of 500; acquisition of 100 common shares by Emanuel Sacks, officer, making a holding of 645; acquisition of 100 common shares by Robert A. Seidel, officer, making a holding of 780; acquisition of 100 common shares by Theodore A. Smith, officer, making a holding of 135.

Republic Aviation Corp. Disposal of 100 common shares by John J. Ryan, officer, leaving a holding of 1,254.

Rohr Aircraft Corp. Disposal of 400 common shares by Burt F. Raynes, officer, leaving a holding of 1,280.

Trans World Airlines, Inc. Disposal of 700 common shares by E. O. Cocke, officer and director, leaving a holding of 1,424; disposal of 600 common shares by A. V. Leslie, officer and director, leaving a holding of 390.

United Air Lines. Acquisition of 200 common shares by Paul A. Bissinger, director, making a holding of 800.

Western Air Lines Inc. Disposal of 500 capital shares by Arthur F. Kelly, officer, leaving a holding of 2,500.

Westinghouse Electric. Acquisition of 500 common shares by John M. Schiff, director, making a holding of 11,500.

Certificates of Necessity

Washington — Kelsey-Hayes Wheel Company of Jackson, Mich., has been awarded a $750,000 certificate of necessity with 40% allowed for rapid tax amortization, by the Office of Defense Mobilization. The facility is for the manufacture of aircraft engine parts.

Other recent certificates are:

Rohr Aircraft Corp., Riverside, Calif., military aircraft parts, $111,628 certified with 65% allowed.

Convair Div. of General Dynamics Corp., San Diego, Calif., engineering test laboratory, $145,000 certified with 60% allowed.

The Wheland Co., Chattanooga, Tenn., aircraft parts, $235,000 with 65% allowed.

Bendix Aviation Corp., Pioneer-Central Div., Davenport, Iowa, aircraft instruments, $229,000 certified with 40% allowed; Bendix Products Div., South Bend, Ind., aircraft parts, $146,955 certified with 65% allowed; Scintilla Division, Sidney, N. Y., military aircraft engine parts, $551,331 with 65% allowed.

C. B. Knapp & Sons, Maplewood, N. J., military aircraft instruments, $153,186 certified with 70% allowed.

Goodyear Aircraft Corp., Akron, Ohio, aircraft parts, $232,854 certified with 65% allowed.

Goodyear Tire & Rubber Company of California, Los Angeles, Calif., aircraft parts, $230,050 certified with 65% allowed.

The United Tool & Die Co., West Hartford, Conn., aircraft parts, $76,750 certified with 70% allowed.

Temco Receives More Electra Subcontracts

Additional Lockheed Electra turboprop transport subcontracts covering development and production of wing tips and leading edges has been awarded Temco Aircraft Corp., Dallas, Tex., by the transport's manufacturer. Lockheed previously gave Temco responsibility for engineering and making Electra ailerons, aileron tabs, and wing flaps.

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FOR RESISTANCE THERMOMETERS AND THERMOCOUPLE THERMOMETERS

EACH SWITCH HAS "OFF" POSITION PLUS NUMBER OF POINTS LISTED.

Points	Size	Switch Part Numbers Thermocouple Type	*3 Wire Resistance-Thermometer Type
2	2"	1152	36SR2
3	2"	1153	36SR3
4	2"	1154	36SR4
5	3"	1055	37SR5
6	3"	1056	37SR6
8	3"	1058	37SR8
9	3"	1059	37SR9
10	3"	10510	37SR10
12	3"	10512	37SR12
16	3"	10516	37SR16
18	3"	10518	37SR18
20	3"	10520	37SR20
24	4"	2752482	38SR24
28	4"	2752884	38SR28
40	4"	3852C	

*Resistance thermometer switches are provided with a safety resistor on off position.

2" SIZE

3" SIZE

SPECIAL SWITCHES

No. 37S6C2, Four "4 Point and OFF" thermocouple switches combined in one 3" case.

No. 9S5, Single Pole, Four Point Instrument Switch in 1¼" round case.

No. 44S4, Six Pole, Double-throw Instrument Switch in 2½" round case, one hole mounting, ½-32 threaded bushing.

4" SIZE

DESIGNED FOR TEST WORK AS WELL AS FOR PERMANENT INSTALLATIONS. LEWIS SELECTOR SWITCHES ARE CONSTRUCTED WITH STURDY CONTACTS OF LOW RESISTANCE AND POSITIVE DETENT. THESE SWITCHES ARE SPLASHPROOF, DUSTPROOF AND ARE BUILT TO GIVE YEARS OF SERVICE.

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NAUGATUCK, CONNECTICUT
Manufacturers of Complete Temperature Measuring Systems for Aircraft

For want of a nail the shoe is lost,
for want of a shoe the horse is lost,
for want of a horse the rider is lost.

George Herbert's statement applies to electronics today as it did to riders three centuries ago. The point may be illustrated by considering a vital electronic unit made up of thousands of components. If the least of these components fails, the whole unit may fail—and with it a strategic military mission.

The problem of *reliability* is becoming increasingly important as the science of electronics advances. "Black boxes" are hard pressed to perform more complicated tasks with increasing efficiency. And at the same time, the requirements call for smaller dimensions. Notwithstanding environmental extremes of an order hitherto unknown, every resistor, capacitor and relay *must* perform *reliably.* Each "nail" is critical.

That is why RCA is continuing its vigorous search for ways and means to increase the reliability of every component in an electronic unit. This program never ceases. It follows through from design to field evaluation. Everything learned is immediately applied to current development and production.

In seeking a degree of electronic perfection never before attained, RCA joins hands with others in this field. This matter of *reliability* is an industry challenge to be met by ingenuity, brain power and engineering knowledge wherever it is found.

DEFENSE ELECTRONIC PRODUCTS
RADIO CORPORATION of AMERICA
CAMDEN, N.J.

Sperry Sharpens New Executive Tool

By Henry Lefer

Great Neck, N. Y.—Sperry Gyroscope Co. is devising a new weapon to throw into the continuing struggle to reduce the cost of arms and give the Government more for its defense dollar.

Current plans for the weapon—the application of data-processing techniques to the problems of top operating management—include setting up a system of more-scientific inventory control based on the latest "operations research" or other mathematical management formulas.

Operations research, a fairly new and fast-expanding field, hopes to find the solution to highly-complex management operational problems through the use of tools such as statistical and probability techniques, mathematical analogies representing physical situations or application of servo theory and the feed-back concept.

Industry, however, could never have considered the wide use of these tools before the development of the high-speed computers which make it possible now to solve in days or hours complexities that would have required years or months by old mathematical methods.

Feed-Back Concept

The feed-back concept is basic to servo theory—a system puts out information that, fed back into the system, automatically controls future operation to achieve a fixed objective.

Sperry's experience in the creation of feed-back systems has made the company especially aware that the value of guidance data ground out by these systems is no better than the factors and programming cranked in. As with high-speed "electronic brains" and computers, the results may be useless if the input data is incorrect or incomplete.

So, as the first step before instituting the new data processing technique, the company saw the need for sharpening up the ability of its operating managers to correctly evaluate the cost factors affecting inventory decisions. This opening phase took the form of a five-day seminar for 35 Sperry divisional managers on applying the principles and formulas of operations research to inventory control.

The seminar was conducted by Prof. Louis J. De Rose, training and management consultant, and head of the Department of Management at Fordham University.

Top-Level Approach

The top-level approach makes the program unique, Sperry believes, in that it introduces the control factor of managerial judgment as a first step before the selection and programming of suitable data, and that it attempts to apply these new formulas from the top down instead of the bottom up, as in the normal computer solution of inventory problems. De Rose, who has conducted training courses for the Aircraft Industries Assn. and a number of leading aviation companies, believes that the Sperry seminar marks the first time in aviation industry that this approach has been used on such a high management level.

Reports from the line executives, outlining suggested techniques for more effective handling of inventory, are now being analyzed. Many of the reports call for the use of computer formulas, with appropriate modifications to fit the variables of military production, as an aid to decision making.

Why Inventory Control

Sperry chose to kick off the program with inventory control for several reasons:

• **Far-reaching effects.** It presents across-the-board ramifications, affecting engineering, production, cost control, purchasing, accounting, field service, administration, planning, sales and other activities.

• **Economy.** The effect of economies introduced at the inventory level is amplified by the time it reaches the other end of the pipeline. One dollar saved here is equivalent to 10 dollars in additional sales, the division managers were told. Thus, Sperry sees its multi-million-dollar inventory as a promising source of important benefits both for the company and its chief customer, the Government.

• **Flexible mobility.** Gen. Edwin W. Rawlings, chief of the Air Materiel Command, has said: "Logistics is the muscle of striking power, as strategy is the brain." Inventory control, De Rose points out, is one of the nerves running through the logistics muscle. It helps to give an organization—military or industrial—flexible mobility, which is more important in the air-atomic age than the mere stockpiling of weapons and supporting equipment, according to Gen. Rawlings.

General and Specific

In the seminar sessions, De Rose showed how Sperry's inventory control problem could be broken down into separate workable parts, with cost factors appropriately weighed. Then, at a final session the managers picked up De Rose's theoretical outline and suggested modifications to make it fit the company's specific problems.

Inventory, De Rose pointed out, is

GIVE AND TAKE—Sperry division managers at seminar discuss a point with professor.

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Pan American World Airways · KLM Royal Dutch Airlines

Simulators for the DOUGLAS DC-7C

Pan American World Airways

Simulator for the BOEING STRATOCRUISER

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U. S. Air Force

Simulators for the
DOUGLAS C-124 GLOBEMASTER

U. S. Navy

Simulator for the
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1049G SUPER CONSTELLATION

Air France

Simulator for the LOCKHEED
1649 SUPER CONSTELLATION

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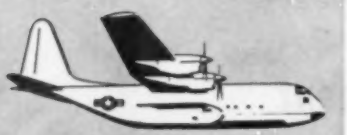

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Simulators for the LOCKHEED C-130 TURBOPROP TRANSPORT

U. S. Air Force
Simulator for the CONVAIR C-131 FLYING SAMARITAN TRANSPORT

For safety and cost reduction in commercial and military aircraft operation

Electronic Simulators, built by Curtiss-Wright, save millions of dollars, thousands of man-hours.

One of the greatest single factors in improving safety, and at the same time saving literally millions of airline and military dollars, is the growing worldwide acceptance and demand for Electronic Flight Simulators developed by Curtiss-Wright. It costs approximately $400 to keep a four-engine aircraft aloft for an hour. But for less than $30 per hour, pilots and crews can "fly" the Electronic Simulator built by Curtiss-Wright—gaining experience identical to actual flight — without ever leaving the ground — releasing multi-million dollar equipment for earning, not learning. U.S. Air Force studies show that at a single training base, over $4,000,000 per year is saved by Simulators.

A Simulator is constructed around the actual crew compartment of the aircraft it represents, complete with all instruments and controls. The physical resemblance stops here . . . but not the realism. The Simulator — a complex arrangement of analog computers that actuate, through servomechanisms, all controls and instruments — faithfully reproduces the flight characteristics, the engine and aircraft sounds of the prototype. For all practical purposes the pilot is flying. The feel of flying is in the response of his controls. His instruments are in action. A "trouble" console can present him with problems he might not encounter in months of actual experience — ice, snow, sleet, malfunction of equipment, turbulence. Varying sounds warn him of trouble. Red lights tell him of danger.

And to familiarize crews with the weather, geography, seasons which they will later experience, the Simulator can reproduce any route in the world, all navigational problems, complete to such things as radio static — at the flick of a switch.

So effective is flight simulation, and so vital to the economics of crew familiarization, that the Air Force has specified Simulators for every operational aircraft type scheduled for production. Curtiss-Wright now has sixteen military and six commercial Simulator types in production and service. Major world airlines, as well as the military, have ordered and reordered Simulators — the most effective and economical means of developing skilled crews.

Only through electronics is such flight reproduction possible. Only Curtiss-Wright, with basic patent rights in this field, and its licensees, build Simulators, and Duplicators, for both the Armed Services and commercial airlines of the world.

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The Curtiss-Wright Electronics Division has permanent career positions open for specialists in aerodynamics, engine performance analysis, aircraft systems design, advanced control systems design, servomechanisms, circuits, instrumentation, digital computers, and motor-tachometer generators. Personal and confidential interviews will be scheduled only after receipt of complete typewritten resumes, giving full detail of education, past experience, and current earnings. Resumes should be directed to Dept. COR 56, Curtiss-Wright Corporation, 30 Rockefeller Plaza, New York 20, N. Y.

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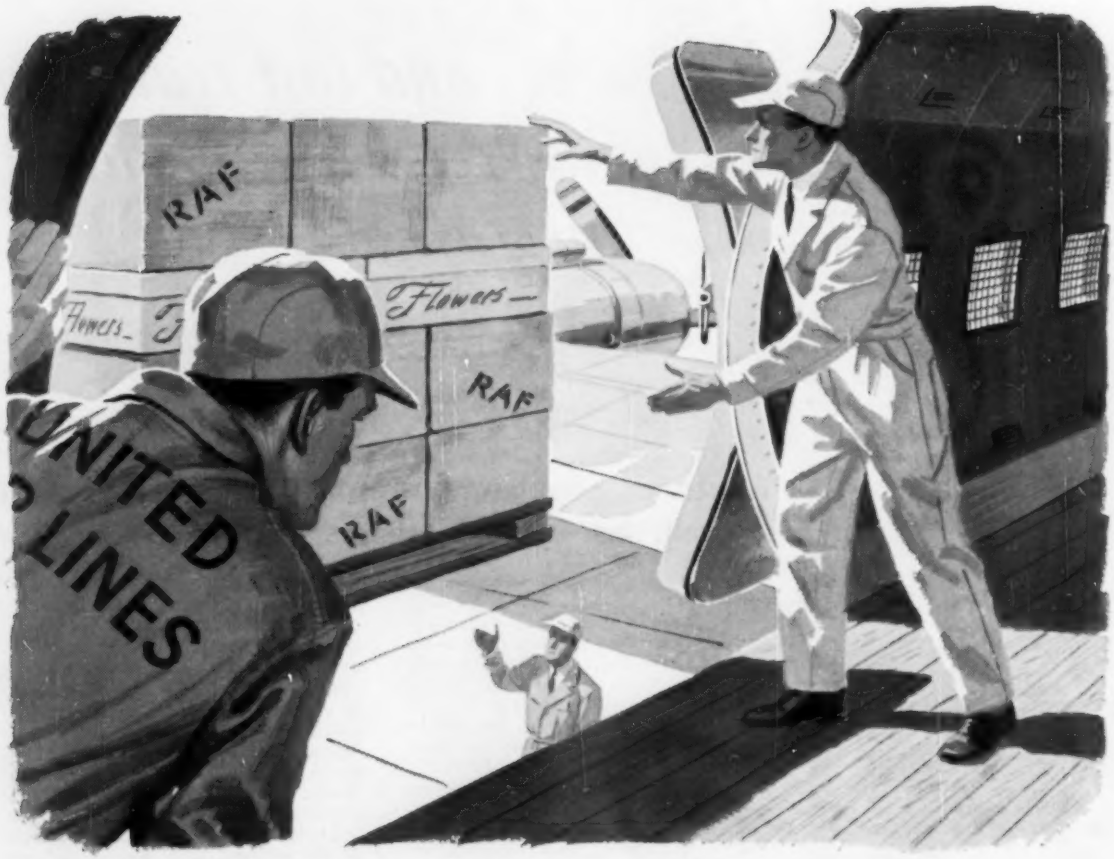

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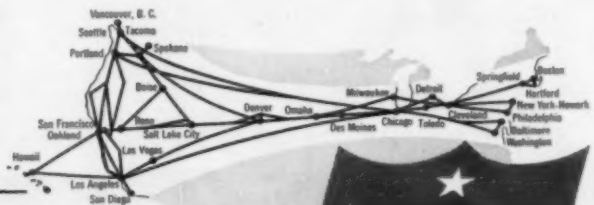

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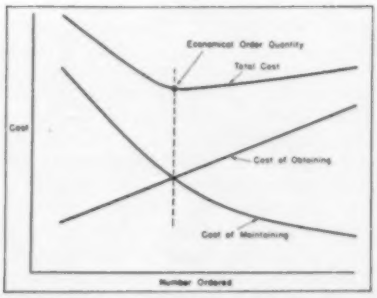


INVENTORY CONTROL FORMULA shows how costs of maintaining and obtaining must be composed to get best total cost.

raw material, work in process, component or finished parts and finished products, held in storage awaiting use or sale, or in the process of being manufactured.

Its control requires the establishment and maintenance of a store of material and parts capable of assuring manufacture according to a production plan based on sales requirements, and at the lowest possible ultimate cost.

Thus inventory control involves the determination of inventory quantity standards, establishment of an adequate control system, checking of physical quantities against records, reducing of waste through salvage operations, and the handling of stores efficiently. Inventory items must be examined with regard to their value in dollars, their usage and their exposure to such risks as order cancellation and engineering change.

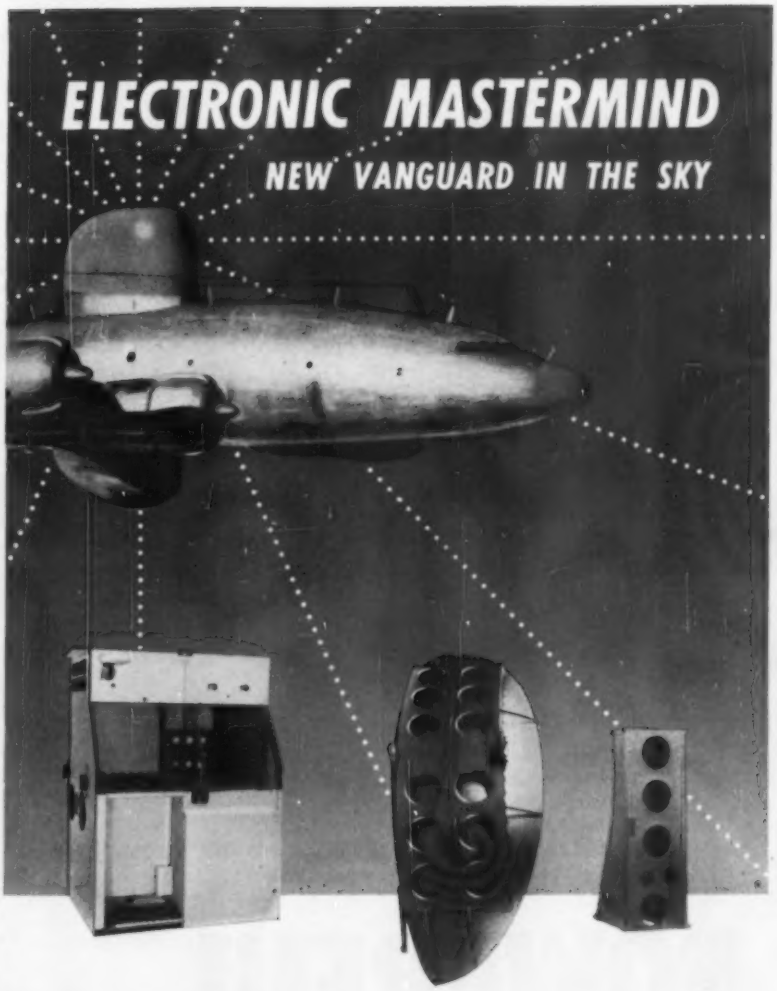
Conflicting Considerations

In order to arrive at the lowest ultimate cost, it is necessary to consider:

- **Cost of obtaining** involved in ordering and replacing production and purchased inventory.
- **Cost of maintaining,** reflecting the establishment, carrying and protecting of the inventory.
- **Cost of being out of stock,** reflecting the price, direct and indirect, management must pay for not having stock when required.

These factors generally conflict. For example, if the company estimates that it will need 1,000 units of a specific item for inventory purposes during the year, the minimum unit cost of obtaining this quantity results when the entire annual requirement is ordered at one time. Furthermore, the company is sure it will have the item when needed.

However, this will mean very high maintaining costs—money tied up in stock, space tied up in warehousing, possible taxes, losses due to obsolescence and engineering changes. Thus, the costs of maintaining the stock go



THESE RADAR COMPONENTS *fabricated by Lavelle help make advanced concepts in the use of electronics a working reality. Lockheed's unique picket plane is such—a complete airborne radar search and control center for both offensive and defensive operations. Images fed by the "piggy-back" radar to the control center radarscope give altitudes of all aircraft within radar range.*

Radar Reflector and Reflector Support for the plane's complex height finding system were designed and produced by Lavelle in close cooperation with Philco Corporation. Like the intricate Radar Console housing, also made by Lavelle for Philco, they are typical of the precision components fabricated by Lavelle for leading electronics, jet engine, and aircraft manufacturers.

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RAYTHEON Silicon Power Rectifier

Typical of Raytheon's new approach to old problems is this revolutionary Silicon Power Rectifier. It is superior to ordinary rectifiers six ways:

- Extremely small, rugged, reliable
- Wider temperature range (−55° to +170° C.)
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This Raytheon "first"—with major applications in military aircraft, guided missiles and in many other areas requiring DC power—is further evidence of Raytheon's "Excellence in Electronics."

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up as the quantity ordered each time goes up.

A simple formula defining the "economical order quantity," which has arisen out of industry experience with this problem, is one of the tools available for dealing with inventory, De Rose said. Once top management has properly weighted the terms of this formula, lower echelons have a simple guide which enables them to make inventory decisions without constantly taking up management's time on these problems. The formula:

$$EOQ = \sqrt{\frac{2 \times \text{Annual Req. (in \$)} \times \text{Ordering Cost}}{\text{Carrying Rate} \times \text{Unit Cost}}}$$

In order to use the formula properly, management must first factor into the terms its own experience.

Reducing the Inventory

De Rose suggested that trying to maintain inventory at high levels to minimize the cost of being out of stock creates a pyramiding proposition —an excess of raw material at the first stage, to an excess of detail parts, to an excess of sub-assemblies, and so on, with each stage compounding the excess of previous stages. He suggested that management instead might give itself time protection by allowing longer lead times for high-cost inventory items; on unpredictable quantity items, management might protect itself by setting up a schedule permitting incremental production above estimated absolute requirements.

Management may be carrying a high inventory of slow-moving sales or product stock as "insurance" against sudden demand. Analysis of the stock may show the possibility of moving the inventory back to an earlier stage of assembly, De Rose said, stockpiling sub-parts common to various products rather than items closer to the finished stage. This would provide a bank deposit to draw against at lower cost than a similar reserve at a more advanced stage.

Another major contributor to high inventory costs is lack of adequate standardization, De Rose said. This problem can be attacked profitably from the bottom up, starting with the simplest nuts and bolts, by reducing the number of types, inventory requirements can be cut correspondingly.

Managers' Viewpoint

A more careful weighing of engineering changes, balancing the economic cost against the expected performance improvements, would cut down on inventory problems by reducing the amount of stock that is made obsolescent by these changes, De Rose said.

In the give-and-take of the discussions following De Rose's presentation, the division managers generally felt the inventory control problem fell into these compartments:

- **Study the inventory situation** to get exact data on what is done and what needs to be done, and attempts to reconcile opposing viewpoints.
- **Inform top management** of the problems and difficulties at the working level, and present suggestions for their solution.
- **Get from top management** working guides and authorization to implement the solution.
- **Set up procedures** and an organization, either part-time or full-time, with responsibility for day-to-day administration of the problem.
- **Improve communications** and prevent "freeze-up" of channels between departments.
- **Sell program** to lower echelons.

The reports from the individual managers, after collation by J. J. Rutherford's office, will be circulated for comment before final implementation, De Rose said.

Industry Interest

The recently completed seminar is De Rose's second such project for Sperry. A previous training course was held for lower-echelon personnel. Other De Rose clients in the aviation industry include Hamilton Standard Division of United Aircraft Corp., Bendix Aviation Corp., Curtiss-Wright, Westinghouse, General Electric and Canadair.

Starting in 1953, De Rose conducted a course on aircraft buying for the Aircraft Industries Assn. In three-week sessions extending over a period of two years, classes were held for a total of more than 300 procurement and materials executives and specialists from the Air Force, Bureau of Aeronautics and the aircraft industry.

De Rose is also a member of the American Arbitration Assn. and is permanent arbitrator in several labor-management contracts. His offices are in New York.

University Offers Summer Course in Air Safety

Los Angeles—The flight safety program offered military pilots at the University of Southern California has proven so successful that a short summer course is being made available to aviation personnel.

The course is scheduled for July 25 to Aug. 7, 1956, and will deal with techniques of investigating civilian and military aircraft accidents to determine cause factors, according to Dr. Louis Kaplan, Coordinator of Flight Safety Training at USC. Preparation of accident reports also will be included.

how to make a "Tiger" roar!

TELEFLEX® cable control assures positive throttle action on new Grumman F11F-1

Flashing into supersonic speeds, the pilot of the Navy's new Grumman Tiger jet gets instantaneous response when he gives it the gun. The throttle control that pours on the fuel is provided by a 20-foot Teleflex control linkage.

In designing the F11F-1, Grumman fighter built to pioneer in using the new "area rule," Grumman engineers wanted a throttle control system that would—

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DESIGN ENGINEERS: For detailed engineering data, write to TELEFLEX INCORPORATED, 125 S. Main Street, North Wales 9, Pa., for your copy of Catalog 400.

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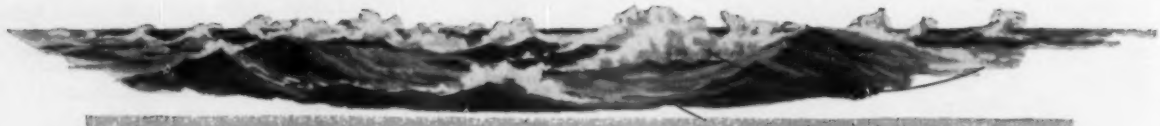

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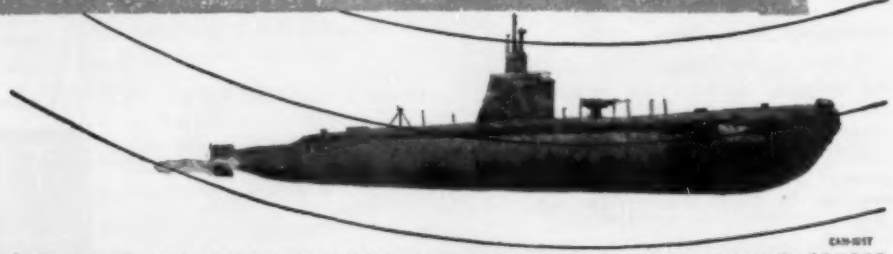

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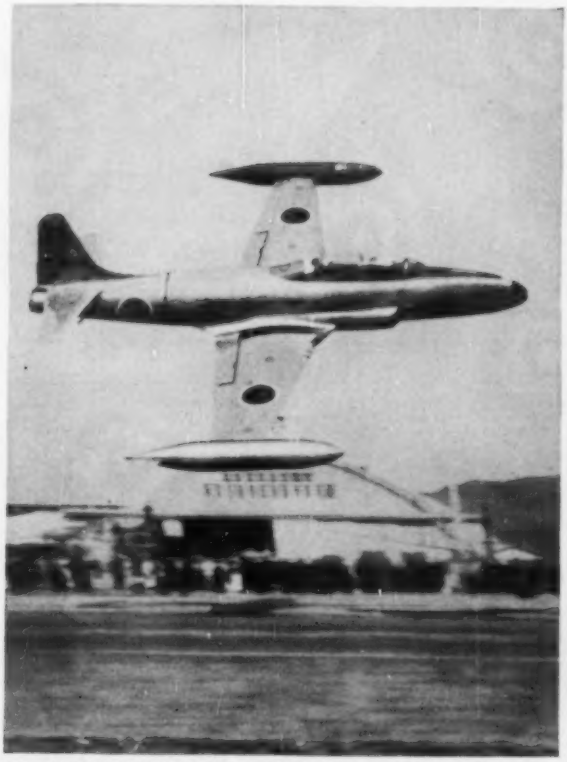
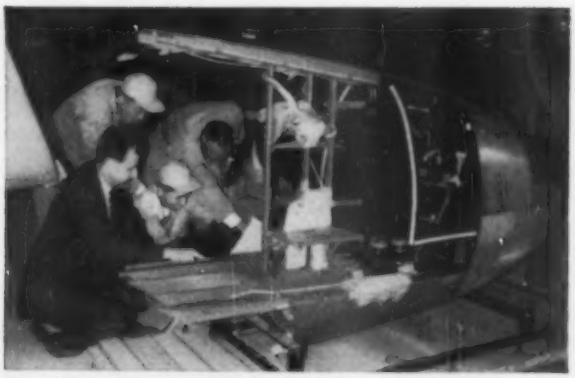
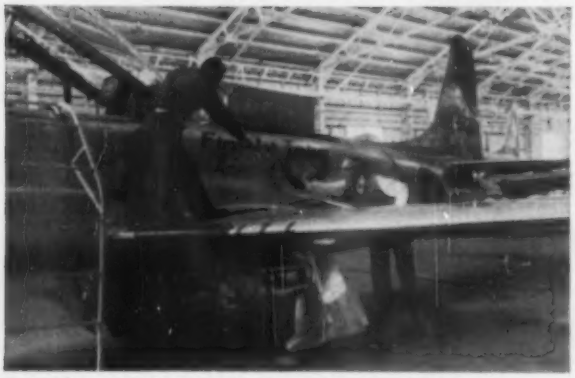






RISING SUN EMBLEM flys again over Japan on wings of T-33 jet trainer (left) assembled by the Kawasaki Aircraft Corp. Picture at right shows U. S. technicians from Lockheed instructing Japanese engineers in assembly methods for the T-33.

Japan Assembles T-33, Enters Jet Age

By Dan Kurzman

Tokyo—Japan successfully tested its first postwar domestically assembled jet aircraft in mid-January, ushering in a new era in Japanese aviation.

The plane was the first of 180 T-33s scheduled for assembly and eventual manufacture, in Japan by June 1958 for use by the growing Japanese Air Defense Force.

Pioneering this comeback of Japan's aircraft industry is the Kawasaki Aircraft Co., which is putting together the T-33 airframes with technical aid from Lockheed Aircraft.

According to Lockheed technicians, the Japanese firm is doing a remarkable job. The 500 Kawasaki employes working on the project are registering an 80% learning curve.

Only 4,800 manhours were required to assemble the first T-33—1,200 less than the original estimate. And the quality of their work was reflected in the flight tests, which revealed only very minor flaws in the finished product, although Kawasaki had been able to do little pre-flight ground testing because of the lack of equipment.

"Once these Japanese learn what to do, they do it as well or better than most American technicians," Lockheed's technical superintendent, Michael Creamer, told AVIATION WEEK.

The one American complaint lies in the fact that the Japanese tend to obey their superiors blindly. Unlike U. S. workers, they seldom question orders given them, even if they know these orders may be faulty. Thus, the U. S. engineers at Kawasaki say, they must be doubly careful to give instructions 100% correct all the time.

To Build 180 T-33s

Kawasaki is to turn out 100 planes by June 1957. The total cost of about $18.6 million for this first segment of the program will be divided between the U. S. and Japanese governments, the former providing around $11.4 million, or 70%, and the latter, $7.2 million, or 30%.

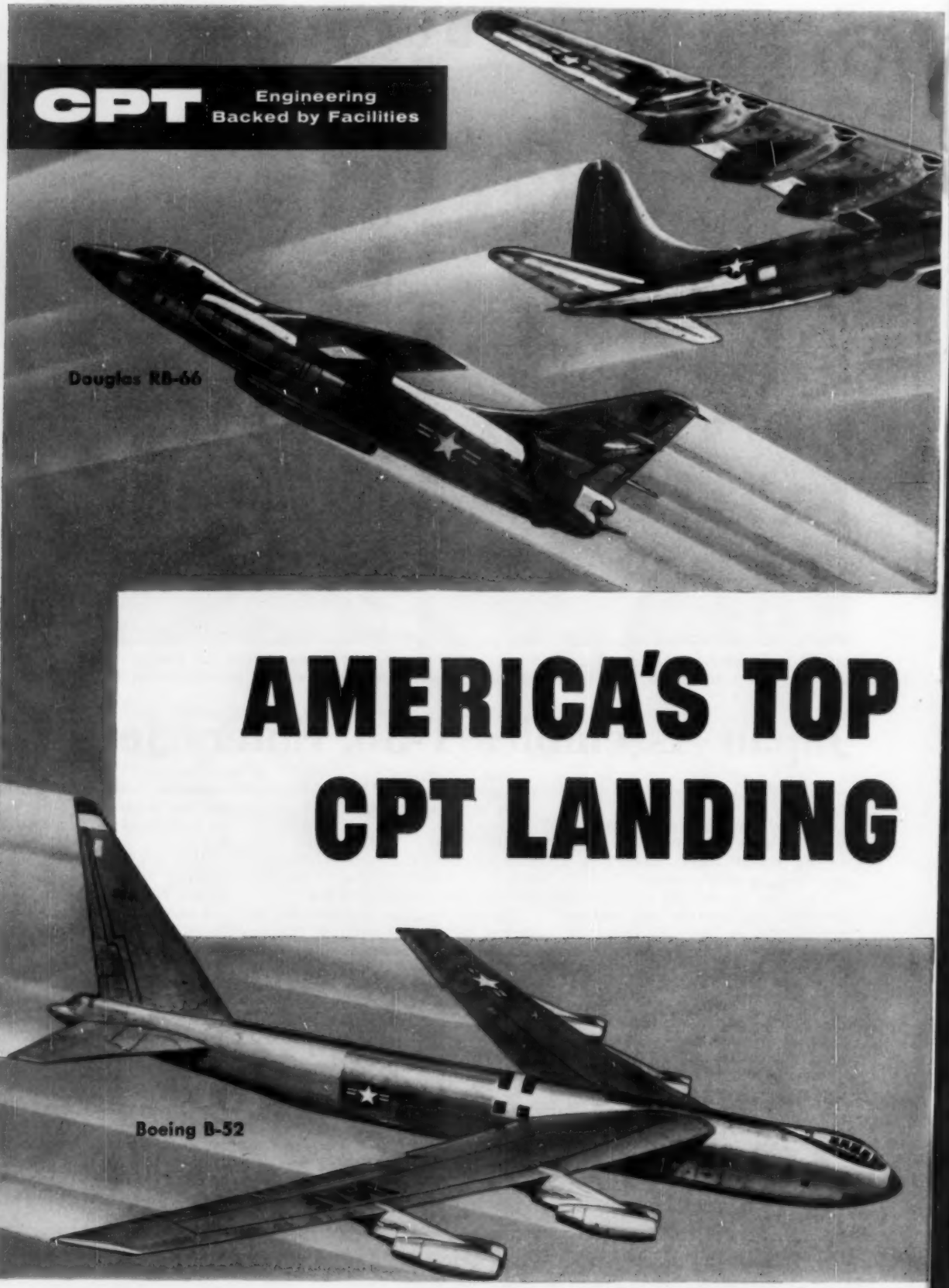
The U. S. share will cover technical aid, licensing expenses and all costs in connection with the production and handling of parts until they are loaded on Japanese ships at the port of Los Angeles.

Japan will pay all subsequent costs, including ocean transportation, assembly and flight testing.

A second agreement, soon to be concluded, provides that Kawasaki will produce another 80 aircraft from July 1957 to June 1958. The percentages each country will pay will probably be reversed under this accord. For as native capacity to manufacture parts increases, American shipments will diminish accordingly.

Kawasaki's T-33 production schedule for 1956 calls for: one each in January, February and March; two each in April and May; three each in June and July; five each in August, September and October; six in November; eight in December. The schedule for 1957: eight in January; 10 each in February, March, April, May and June.

Three of those scheduled for completion in June 1957, however, may be carried over to the second program start-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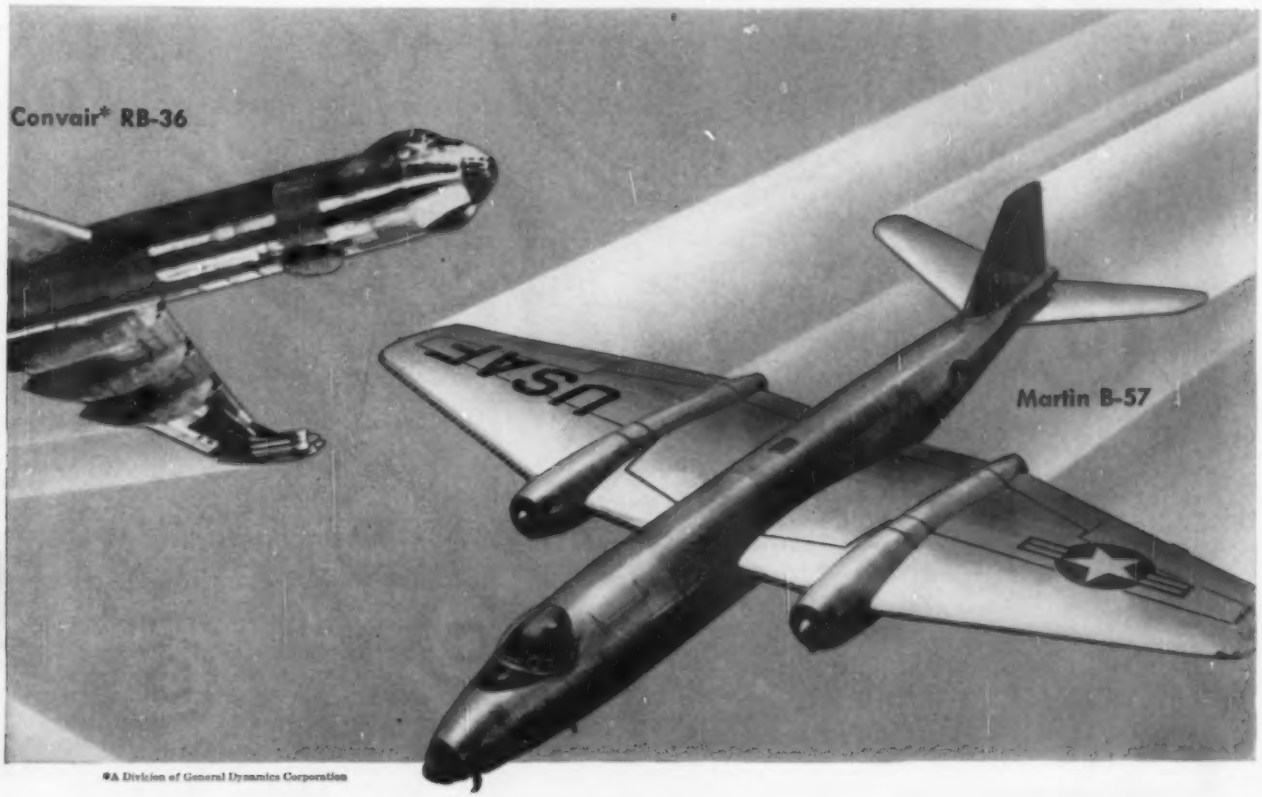

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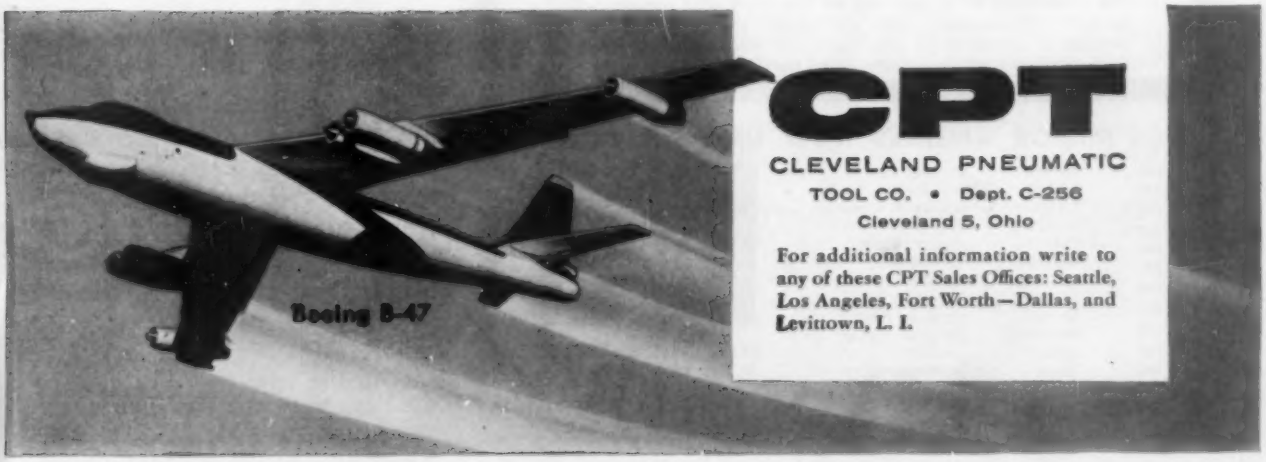

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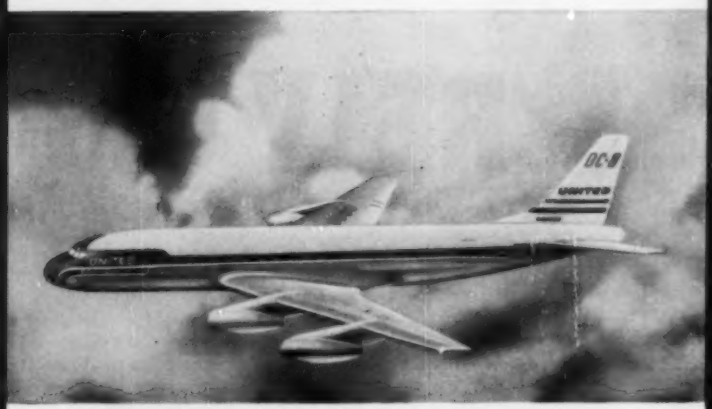

THE DOUGLAS DC-8, powered by four P&W J-57 engines, will carry 112-140 passengers and 7000 lbs. of freight over 3000 miles non-stop at speeds up to 575 m.p.h. Seat-mile costs of operating these jets may even be less than latest piston types.

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ing in July, due to budgetary considerations.

Kawasaki's Role To Grow

The U. S. is sending the first 20 aircraft in knockdown form, the initial two ready for final assembly and the rest in progressively detailed parts. Ten sets of completely detailed parts will follow, all to be assembled with tools manufactured entirely in Japan.

By the thirty-first aircraft, the fabrication of parts from Japanese raw materials will begin and 30% of the plane will be made up of such items. Kawasaki will also, from then on, assume complete responsibility for turning out the plane, including procurement of raw materials and parts, tooling, fabrication, and actual assembly. By the fortieth T-33, the company will be manufacturing as much of the aircraft as Lockheed does at its own plants. The percentage of parts made in Japan will increase to 70 by the seventieth plane and possibly to 80 or 90 by the hundredth.

By the seventieth aircraft, it is calculated that Japan will furnish such airplane parts and equipment as electrical couplings, exciters, dynamotors, inverters, dehydrators, hydraulic valves, cylinders, fuel cells and pumps. It will also produce many of the screws, bolts, nuts, washers, pins, clips, clamps, terminals and bearings that are needed. By the hundredth plane Japan is expected also to provide switch assemblies, refrigerators, box controls, actuators, relays, starters, light assemblies and blowers.

The nation may eventually supply 100% of the fuel cells, fuel pumps and light assemblies required. But the U. S. will furnish part of most other items listed above, especially those of small value, throughout the program, though in gradually decreasing percentages. U. S. will supply all tailpipes, ducts and scoops, as they could not be manufactured economically in Japan.

Sharing the Know-How

Under its technical aid agreement with Lockheed, Kawasaki is learning manufacturing know-how and methods and obtaining engineering data, airplane and tool designs and master tooling. The U. S. will pay about $500,000 for this assistance, plus more than $1 million in maintenance costs incurred by Lockheed's 57 technicians now advising Kawasaki.

It will provide an additional $600,000 for 30 more technicians due to join the Lockheed mission in the second year of the program.

The Lockheed team includes a general manager, secretary, production superintendent, technical superintendent, pilot and flight operations expert and general engineering expert. Other Lock-

MORE WORKING space and greatly increased production facilities will permit Resistoflex to meet the overwhelming demand for Fluoroflex®-T hose.

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eed specialists are five in training and administration, seven in material, eight in production, eight in tool manufacturing, six in plant engineering, seven in manufacturing and industrial engineering, and 10 in quality engineering.

These men are guiding a Kawasaki working force of about 500, which will grow to 2,000 by the end of 1956. The Americans do not issue advice to the workers directly. Each works through a Japanese counterpart who directs the work as he learns what to do.

Other Licensees in Program

Lockheed is providing Kawasaki—in addition to technical aid—with many fuselage parts from its own manufacturing plant and obtaining other equipment from subcontractors in the U.S. It is also arranging licensing contracts between American manufacturers of parts and Japanese firms.

Up to now, Bendix International has licensed: Tokyo Keiki Seizosho Co. to produce turn and bank indicators, accelerometers, electrical starters and engine boost controls; Hakushin Electric Works, autosyn transmitters and indicators, magnesyn transmitters and indicators, and instruments using this equipment, including fuel flow meter components; Shinko Electric Co., reverse current relays, voltage regulators and control panels; Kayaba Kogyo K.K., main wheels, nose wheels, brakes, hydraulic valves and controls; Yokogawa Electric Works, jet turbine ignition, magnetos, reciprocating engines, magneto shielding and harnesses, and ignition analyzers.

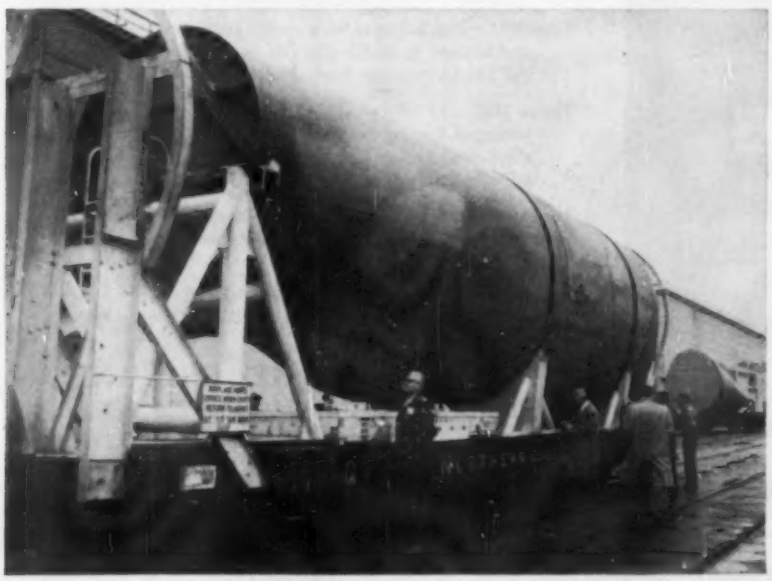
Cannon Electric Co. has licensed Japan Aviation Electronics to manufacture Cannon plugs. An agreement between the B. F. Goodrich Co. and Yokohama Rubber Co. for the production of fuel cells is now pending. Other accords are also being negotiated at present.

However, difficulties in concluding many of the anticipated contracts may considerably slow down plans for a gradual switch to Japanese-made parts.

New Production Facilities

So far, assembly has been done under makeshift conditions in old inadequate buildings at Kawasaki's Gifu plant. But the company is now spending $4.1 million on new production facilities that will be ready for use by next April. About $30,000 is being spent for land, $953,000 for buildings (including new structures, reconstruction, expansion, and removal), $1,308,000 for machinery, $1,400,000 for jigs and tools, and $409,000 for other items. In addition, operation costs will run to $2 million.

An assembly plant with a floor space of 178,000 sq. ft. is almost completed and quarters for Lockheed engineers—28 furnished cottages—have already been built. Nine old buildings, until now used for airframe overhauling, lightplane production and assembly of the first T-33s, are being fitted out for parts manufacture. Their floor space



KC-135 Section by Rail

One of the largest fuselage sections ever to be moved by rail arrived recently at Boeing Airplane Co.'s Renton, Wash., plant after a cautious, nine-day journey from San Diego where it was manufactured by Ryan Aeronautical Co. under a Boeing subcontract. The section will become part of the first production model of the KC-135 jet tanker being built for USAF.

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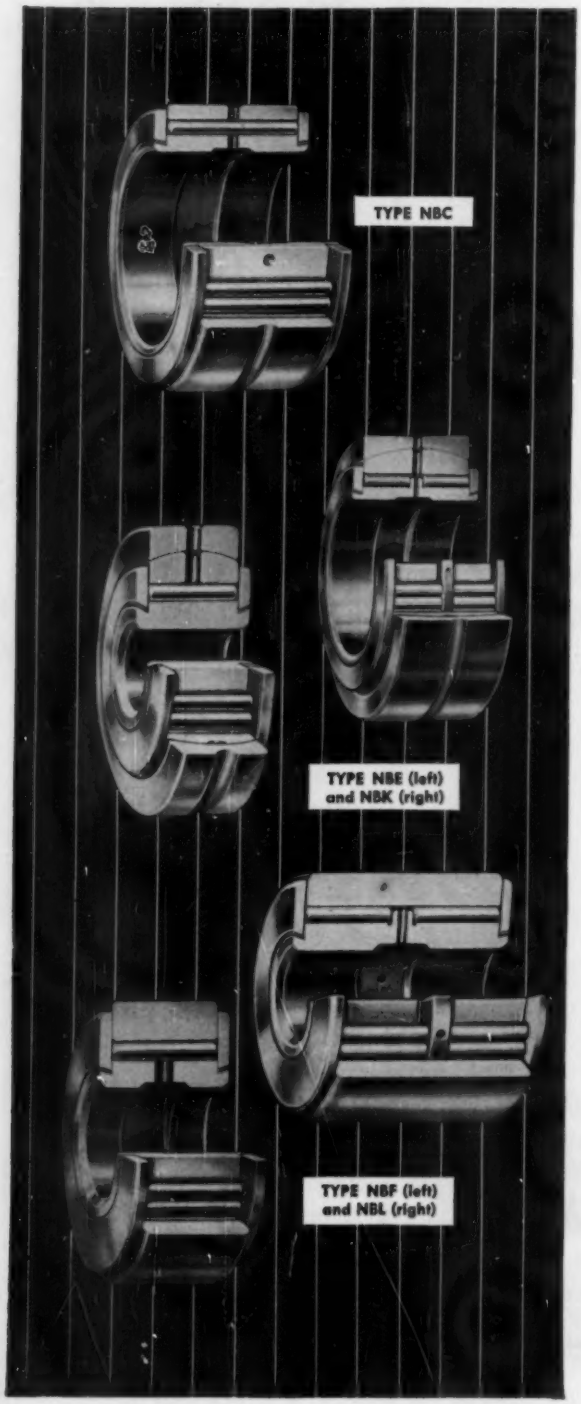

Torrington NB Series Needle Bearings employ the same needle roller principle as the famous DC Type Bearing.

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totals 213,000 sq. ft. Machinery being installed, mostly Japanese-made, includes skin and spar milling machines and stretch presses.

To meet these expenses, Kawasaki will use $1.4 million of its own capital and hopes to obtain $2.2 million in Mutual Security Administration funds and $500,000 in long-term credit bank loans. City bank loans will be solicited to meet operations expenses.

Reborn Industry

The T-33 project will have significant effect on Kawasaki's growth. The offspring of the pre-war Kawasaki Aircraft Industries Co., whos 80,000 employes turned out military aircraft during the war, the firm increased its capitalization from $2,433,000 to $4,866,000 in November 1955, about a month after the T-33 program got underway.

Excluding employes now working on this project, Kawasaki has a labor force of more than 3,000 workers, divided between its Gifu and Kobe manufacturing divisions.

In addition to new facilities being added for the T-33 program, Gifu has a land area of 936,000 sq. ft., a floor space of 473,000 sq. ft., and machinery units numbering 1,104. Kawasaki has produced here the KAL-I (one in 1955) and KAL-II liaison planes, as well as target aircraft, for the Japanese air force, and the KAT-I trainer for civilian aviation schools. Also, airframes for the U.S. and Japanese air forces are overhauled here (167 in 1955). In addition, Kawasaki manufactures about 700 bus bodies yearly at Gifu.

The Kobe site has a land area of 936,000 sq. ft., building floor space of 149,000 sq. ft., and machinery totaling 3,000 units. Kawasaki-Kobe turns out the Bell 47 helicopter (8 in 1954, 14 in 1955, 24 in 1956). Japan's only facilities for the complete overhaul of jet engines (453 in 1955) are also located at Kobe.

Over $2 million was spent in 1954-55 installing these facilities. The company also manufactures 240-hp. aircraft engines here, as well as textile machines, precision gears, safety apparatus and small engines.

The Profit Picture

The T-33 program will greatly enhance the company's activities—and financial standing. Its annual profit from the program is likely to be from 5 to 10%.

Under the U.S.-Japanese agreement, the price of the T-33 airframe, based on the average of the first 100 planes, has been pegged tentatively at $172,000. Of this amount, $94,000 will be borne by the U.S.

Thus, the actual purchasing price to be paid by Japan's Defense Agency would be $78,000. Kawasaki, however,

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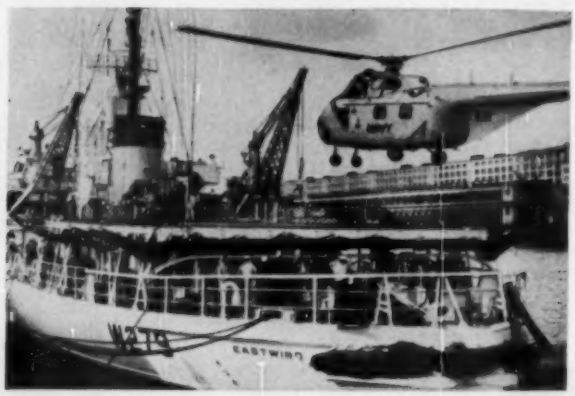
STROUKOFF AVITRUC

Stroukoff Aircraft Corporation

WEST TRENTON NEW JERSEY

HELICOPTER MEDICAL MISSION CROSSES AFRICA—Crossing African jungles and bushland from Leopoldville, Belgian Congo, to Nairobi, Kenya, the Lederle-Sikorsky Medical Expedition flew 2800 miles in a Sikorsky S-55, distributing drugs and surveying health conditions. The expedition again showed the significant role of the helicopter in public health work in Africa. For several years Sikorsky helicopters have been used there in spraying operations to control the tsetse fly, carrier of sleeping sickness, and for other vital health missions. The helicopter's ability to reach inaccessible areas opens new possibilities for the development of equatorial Africa.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS

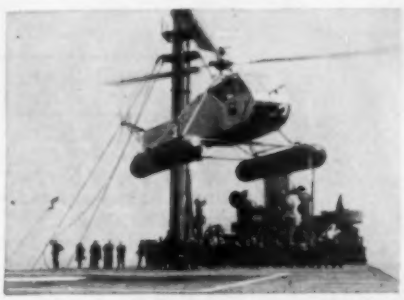


TO THE ANTARCTIC—Landing on the Coast Guard icebreaker *Eastwind*, a Navy Sikorsky HO4S helicopter joins Operation Deepfreeze, the U. S. antarctic expedition. The *Eastwind* sailed from Boston in November. The HO4S is a Navy version of the famed S-55 which serves in quantity in each of the U. S. armed services and is the standby in commercial and military operations all over the free world.

S-58s FOR COMMERCIAL SERVICE—To enter airline service in the U. S. and Europe in 1956, the Sikorsky S-58 is the largest helicopter made available for commercial service. New York Airways plans to buy 7, Sabena Belgian World Airlines 8, all to be delivered starting in the spring. Both airlines currently use S-55s. The new S-58 will carry 12 passengers and will cruise at more than 100 m.p.h. against the earlier model's 85 m.p.h.

THE MARINES HAVE LANDED—this time, by helicopter, landing on a submarine. And the situation is well in hand, with this unique operation again demonstrating the helicopter's versatility, offering new methods of evacuation for the sick and wounded and new possibilities for emergency supply, as well as new battle capabilities. Photo shows a Sikorsky HRS-1 transport helicopter landing aboard the USS *Sea Lion* during exercises off North Carolina. The HRS-1 is the Marine Corps version of the Sikorsky S-55 helicopter, which is also operated by the other armed forces.

HELICOPTER HISTORY



FIRST SHIPBOARD LANDING

In May, 1943, Capt. (now Brig. Gen.) H. Franklin Gregory landed a Sikorsky XR-4 on the deck of the tanker S.S. *Bunker Hill*, in a successful demonstration of a helicopter's ability to operate from the small deck of a merchant vessel. The demonstration took place on Long Island Sound off Connecticut.

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wants to raise the price to about $94,000, but will probably settle for about $83,000.

In any case, the important effect of the T-33 project on Kawasaki's financial position is reflected in the following projection:

From April 1955-March 1956 sales of $7.6 million and profits of $168,000, the company expects to climb to sales of $14.7 million and profits of a little over $1 million in the year April 1956-March 1957. For the half-year, April-September 1957, the company expects sales of $8.6 million and a profit of close to $700,000.

Not calculated in these figures is the business Kawasaki will do if several prospective jet equipment manufacturing projects get underway as planned. Under a $20-million program now being considered by Washington, Kawasaki, with technical assistance from the Allison Division of General Motors supplied through Lockheed, would manufacture 350 J33 jet engines over a five-year period starting next September. (Ishikawajima Heavy Industries would produce J47 jet engines with General Electric Co.'s technical aid in a $30-million five-year venture beginning in April 1958.)

Moreover, Kawasaki, together with three other Japanese aircraft companies, is now designing an intermediate jet trainer for the Japanese Air Defense Force. If its model is selected for manufacture—a decision is slated to be reached this spring—it will obtain sizable orders for the JADF. Preliminary wind tunnel tests have already been made.

Finally, Kawasaki and Lockheed are already thinking of producing F-104 fighter-bombers in Japan when the demand for T-33s starts to taper off, probably in 1958.

PRODUCTION BRIEFING

▶ **Contract for $3.5 million** has been awarded Beech Aircraft Corp., Wichita, by Lockheed Aircraft Corp. for T2V Navy jet trainer wings. The supplemental order will extend Beech production to October 1957.

▶ **Pilot plant heat treating** and laboratory facilities have been established by Metallurgical Consultants, Inc., 4935 E. Slauson Ave., Maywood, Calif. New facilities opened by the firm, organized two and a half years ago, cover over 5,000 sq. ft.

▶ **Microfilmed active records systems** will be handled by a new service department of Filmsort Division, Dexter Folder Co., Pearl River, N. Y.

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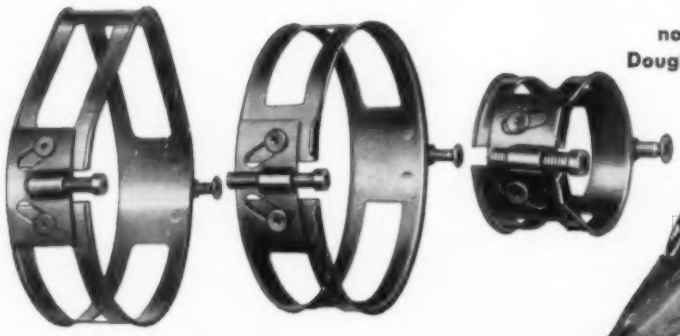

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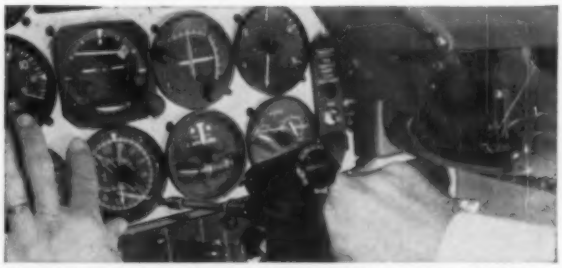

Cam action on master screw tightens the clamp around the instrument. When installation is complete, instrument is locked securely in place.

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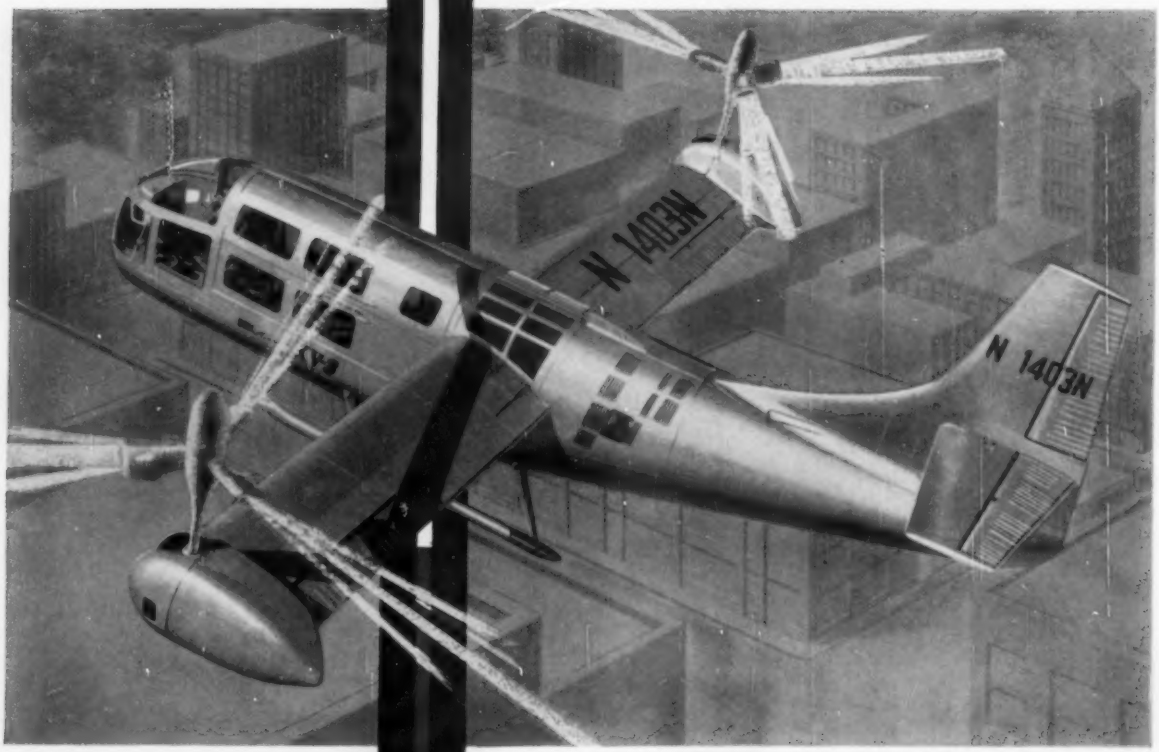

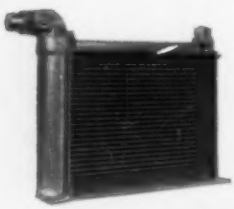

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Britain's Aircraft Needs: Part III

Equipment Dearth Slows British Research

By Sir Roy Fedden

Turning now to a number of technical matters which have held back the production of the new family of post-war British aircraft. These I consider in the final analysis must, to a considerable degree, be laid at the door of the chief engineers and senior executives of industry.

Seeing that the aircraft industry is mainly geared to, and dependent upon, a Government department and is the country's aviation war potential, this necessitates that first consideration must be given to Government requirements, from both national and financial standpoints.

I would have hoped, however, that a closer understanding between the technical sides of industry and the Government would have prevented that undoubted vacillation and unrealistic policy that has existed in several directions.

Because of changing political conditions and situations at home and abroad, there is always the risk of cancelled or reduced contracts. This has resulted in nearly every firm accepting all the work they can get, regardless of their capacity to tackle it efficiently and in a reasonable time. This unrealistic and rather amateurish approach of seizing upon every order possible, has resulted in most firms in the country that have any design team at all being hopelessly overloaded.

Design Frustration

This is all made more difficult because aircraft design is so much more complicated than 10-15 years ago and covers a far wider field of intricate electrical and mechanical equipment requiring first class engineering and entailing overall a total design capacity of anything from 10-20 times the man hours of an aircraft of the last War.

This in turn has resulted in a few cases in a natural but deplorable state of frustration in the design team, born of despair of ever being able to get on top of an impossible mountain of work, which tends to leave a design as it is, rather than grapple with a problem only partially solved, and leads to a feeling that somehow or other the prototype will be got right and in due course production will flow.

I would date the start of many of these troubles to a Government decision not to allow manned supersonic investigation. In consequence we are at least a generation behind the Americans in fighters, and more than that in the basic knowledge needed to produce Mach 2 machines.

Certainly 10 years were lost when it was decided, early after the end of the War, to start high speed research by dropping models from Mosquitos, which was fortunately later abandoned by that far-seeing man, the late Mr. Walter Perring.

Even allowing for the lavish way in which America tackles all design engineering problems and with the usual 3:1 ratio in the numerical strength of their aircraft technical staffs as compared with ours, she still has an advantage of about 2:1 over us. For example, for 1,000 British designers, draughtsmen technicians and test staffs, the American minimum requirements would be 3,000; but their thoroughness and insistence in tackling every phase of design, aerodynamics, structures, high and low temperatures, electronics and armament research, etc., will double this figure to 6,000.

'Penny Numbers'

One of the mistakes made since the War, but already appreciated by the Germans in the last War, was the "penny numbers" ordered off any prototype. This has been fully ventilated already in Parliament and to some extent remedied, but it should have been appreciated by our technical people and insisted upon long ago, and it does not help our current types just arriving, for these can only now be built when production starts.

I would hope that the recent practice of setting up outside design firms, which has sprung up owing to such difficulties, is only a passing phase and an example of the desperate straits in which the industry has found itself. My personal experience has always been that one can not get the personal touch or enthusiasm in this way and that design, development and production in the early stages is the key to efficiency and is largely a matter of inventive thought and effort of a united team.

Computer-Technique Lag

British design executives, desperately overloaded for several years, did not in the main avail themselves as early, or had not the time to investigate, the very real advantages of computer technique as compared with their opposite numbers in U. S. A. In the States, this most important aid to the design and evaluation departments has long passed the novelty stage and has now become a valuable day-to-day tool in the hands of the aviation engineers. The field is widening daily at an astounding pace, and without this equipment a designer would be almost as hemmed in as would be the case if he were deprived of some proven machining principle.

Introduced originally to relieve pressure of work in the stress department, it has been found of immense value in many other spheres.

With our shortage of technical staff it is a particularly appropriate item for full introduction into the British industry, and it is hoped that Cranfield College of Aeronautics will be able to specialize on suitably trained staff for this work.

Aircraft Materials

Up to the beginning of the second World War, Britain was leading on aircraft materials by a considerable margin. I regret to say I do not think this is the case today.

I am not referring so much to titanium alloys, although in spite of Britain having what I understand to be the best production technique for this material, we are well behind U. S. A. in the use of this metal.

I am rather referring to our general approach and leadership in aircraft materials generally.

I do not consider this country has kept pace on materials since the War with the available improvements in technique. In the whole material field, where is there a Brearly, Hatfield, Swinden, Julien or Devereux?

Collaboration Need

I am hopeful that Cranfield may be able to play a greater part on materials in the not too distant future.

I feel the technical side of the airframe industry, suddenly immersed deeply in fatigue problems since the end of the War, might have got out of their difficulties faster if they had more closely collaborated with their corresponding numbers in the engine industry, who have had this bogey with them for the last 30 years. It is possible it is not yet too late for a closer collaboration!

After the War, as a result of visiting the first one or two machine tool exhibitions, I felt this important British industry was really forging ahead, but I regret to say that, as far as the aircraft industry is concerned, I am of the opinion it is now falling behind.

It causes concern to go round our

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best engine and airframe plants and see so many new German, Swiss and American machine tools. With the definite changes in type of manufacture that are coming along, this is likely to become still more emphasized.

In spite of our being supreme in the gas turbine field for the first five years after the War, America has made great strides and is now fairly close on our heels, and I attribute this almost entirely to the great benefit that has accrued from adequate research equipment based on what we saw in Germany immediately after the War.

Vacillation and change of policy has put back our having any full scale altitude engine test equipment. This is required not only for research, but also for early calibration of new prototypes.

The tremendous pull that the U. S. A. has over this country on experimental and prototype engine testing is extremely serious. The advantages that accrue to their engine industry in having the Unitary plan tunnel at Cleveland for testing the latest engines in the Mach No. range of 2 to 3.5 without in any way interfering with research, is of enormous advantage.

Our Government is tackling this matter but in too dilatory a way, and it is anticipated that we may have in four years' time equipment comparable with what the U. S. A. possesses today.

It is good to know that one British firm has taken on the responsibility of their own engine altitude tunnel, and will be ready at least a couple of years before the official equipment is ready. In the meantime, other countries are planning even more advanced equipment.

Wind-Tunnels: U.K. v. U.S.

Similar remarks must be applied to aircraft wind tunnel equipment; although new tunnels are planned by the Government, it is doubtful if they are extensive enough in the high Mach No. range, and there is nothing even thought of corresponding to the two Unitary plan tunnels at Langley and Ames Laboratories in U. S. A. which offer superb facilities for constructors to obtain comprehensive measurements on large scale models without in any way interfering with basic research. Here again, it is difficult to put into words shortly the advantages that will accrue over the next few years as a result of these N. A. C. A. tunnels.

Cleveland and Ames Laboratories were available to the R. Ae. S. (Royal Aeronautical Society) delegates' inspection last summer. No account in these comments has been taken of the comprehensive facilities of the U. S. A. F. at Tennessee or the U. S. Naval facilities at West Trenton.

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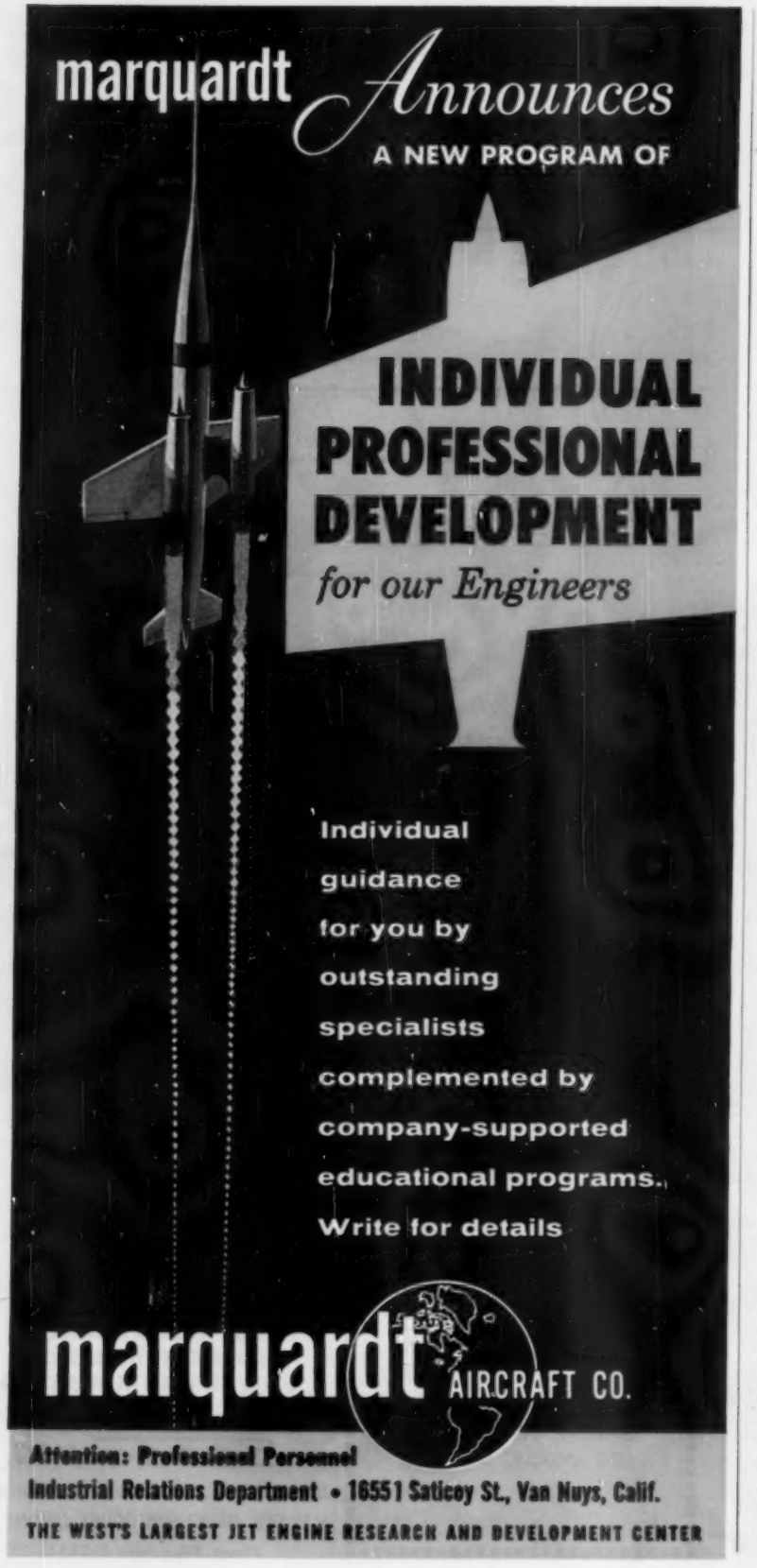


very cramped by our inability to make the high quality supersonic models required for this advanced work, and this again is a serious "bottle neck." These models are at present taking the best part of a year to make and little can be done on the main design of certain aircraft until the tunnel results are forthcoming.

It is felt that some designers and a number of Government officials are not yet realistic about these matters; and that sub rosa, in the background, there is the old bogey that has been bedevilling us for so long in this country, that we can get by without this class of equipment.

'Badly Handled'

It is tragic how badly this whole question of engine and airframe tunnels has been handled since the War. Firstly, by inferring that they were not necessary at all; and then when at last the facts became apparent, hesitation on the right policy to adopt and the steps that would have to be taken to meet anything like the required forward programme. We are a long way from being out of the wood yet on these vital matters.

It is tremendously inspiring to see the morale and keenness that can be engendered with facilities such as exist at Edwards Base. With modern supersonic aircraft, which are just around the corner, it is quite wrong to ask test pilots to do development of new prototypes on certain aerodromes at home.

The attempts to use North Africa have so far been an altogether inadequate stop-gap, and the whole matter requires tackling on an entirely different and more realistic basis.

'Clumsy' Instruments

Not all our test pilots have the technical education and subsequent training necessary to deal with present-day flight problems; some of the firms' performance departments are inadequate for formulating proper flight test programmes, and seeing these carried out. Too many aircraft have left the firms in recent years for Boscombe Down, only to be found seriously wanting in their first flights by service pilots.

Our aircraft instruments are clumsy and heavy compared with those of the U. S. A. Admittedly, there is more opportunity in a greater home market in America with, of course, more competition; but our instrument makers appear too often to wait and take excessive guidance from M. O. S. (Ministry of Supply) and R. A. E. (Royal Aircraft Establishment, Farnborough) instead of going ahead on their own, and keeping in touch with American technique and development.

I understand a committee has been sitting for about five years to decide

whether we should have a heavy modern press or not, an absolute necessity for the new integral sculpturing technique. I believe the members of this committee that have been standing in the way were the aircraft constructors, who have argued amongst themselves as to whether this is the right way to make aircraft or not.

Surely, here is a case where we just could not go wrong by going ahead on one long-term heavy press for a number of requirements, which without any possible doubt will be required. I gather that at last the aircraft specialists are coming round to thinking they want a press, but it must not be more than 25,000 tons.

'Irresolute' Approach

Why this figure nobody knows! I should say one of at least 40,000 tons was necessary, seeing that it takes several years to construct, and in view of what I have seen in the States.

This reactionary irresolute approach of our industry on this matter reminds me somewhat of the severe criticism some 20 years ago on our pioneering work on forged cylinder heads and integral milled finning on the score of extravagance, and the fact that in U. S. A. all heads were cast. For years forging has been obligatory on large high efficiency piston engines, and in U. S. A. today the most modern forging and integral milling technique is universally used on the engines of all long-range four-engine transports.

Industry's Responsibility

I feel that the R. Ae. S., which is composed almost entirely of technologists from industry and the scientific branches of the Government, has missed a great opportunity since the War in not giving their members better leadership and guidance to prepare them for this new family of aircraft. I believe it was, and still is, the Society's duty to take the lead in connection with all matters relating to technical education and problems relating to technologists in aeronautics, and to see how with our limited numbers, our forces can be marshalled and used in a better and more practical way.

Turning now to the responsibility of industry, I feel the S. B. A. C. (Society of British Aircraft Constructors, Ltd.) has failed to appreciate fundamentally the great change that has come about in aircraft technique, and that whereas the Society and all its officers have applied themselves diligently to their tasks, it has for the most part been along the line of the traditional pre-war mould rather than a new approach. By this I do not mean "bigger and better" in the sense of expending large sums of money, but rather an appreciation of the profound changes that have come about, and the need for different tactics.

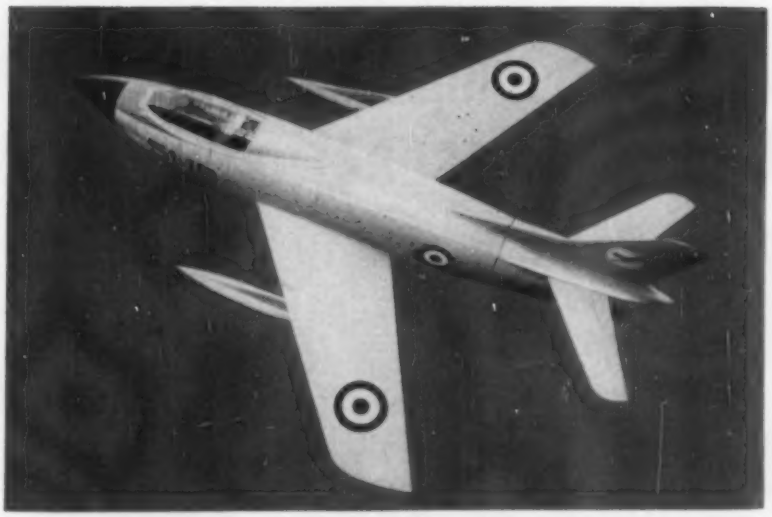
Over this difficult post-war time I had hoped that the R. Ae. S. and the S. B. A. C. might have more closely joined forces, and I was interested to see that in the excellent new I. A. S. (Institute of The Aeronautical Sciences, Inc.) block of buildings at Los Angeles the trade society had their own offices and were daily in touch with their technical counterparts to a very marked degree.

Broader Set-up

Industry, of course, has its many difficulties and problems, and the S. B. A. C. in its 39 years or so of life has been efficiently organized as a successful trade body, but I think it has got to become a broader and more impersonal set-up than it is at present if we are ever going to get the new type of British aircraft phased, timewise and technically, to enable this country to have a strong enough air defense force and a reasonable share of the world's aviation business.

Pre-war, the industry was a much simpler structure, and by hook or by crook it was possible both to "take in each other's washing" and to have enough work to keep nearly two dozen ordinary members going. I suggest that the greater complexity of post-war aircraft technique may have outmoded this procedure altogether, and that one of the chief problems of the S. B. A. C. is that while it is serving its members the way they think they ought to go, this modus operandi does not fill the bill today.

(This is the third in a series of four articles in which Aviation Week is reprinting the speech made by Sir Roy Fedden before Britain's fourth Conference on Problems of Aircraft Production. Sir Roy has served on three occasions as president of the Aeronautical Society and is a former aircraft adviser to the North Atlantic Treaty Organization.)



Fiat Fighter

Latest model of the Fiat G.91 light ground-attack fighter now under development for the North Atlantic Treaty Organization shows the similarity between the Italian design and the North American F-86K being built under license by that firm. The G.91 is being designed by a Fiat engineering team under Prof. Gabrelli. Powerplant for the G.91 will be the Bristol Orpheus, now running near the 5,000-lb. thrust mark in tests. G.91 is competitive with two French designs: the Breguet Taon and the Dassault Mystere 22 series.

Forging Development Eases Titanium Blade Problems

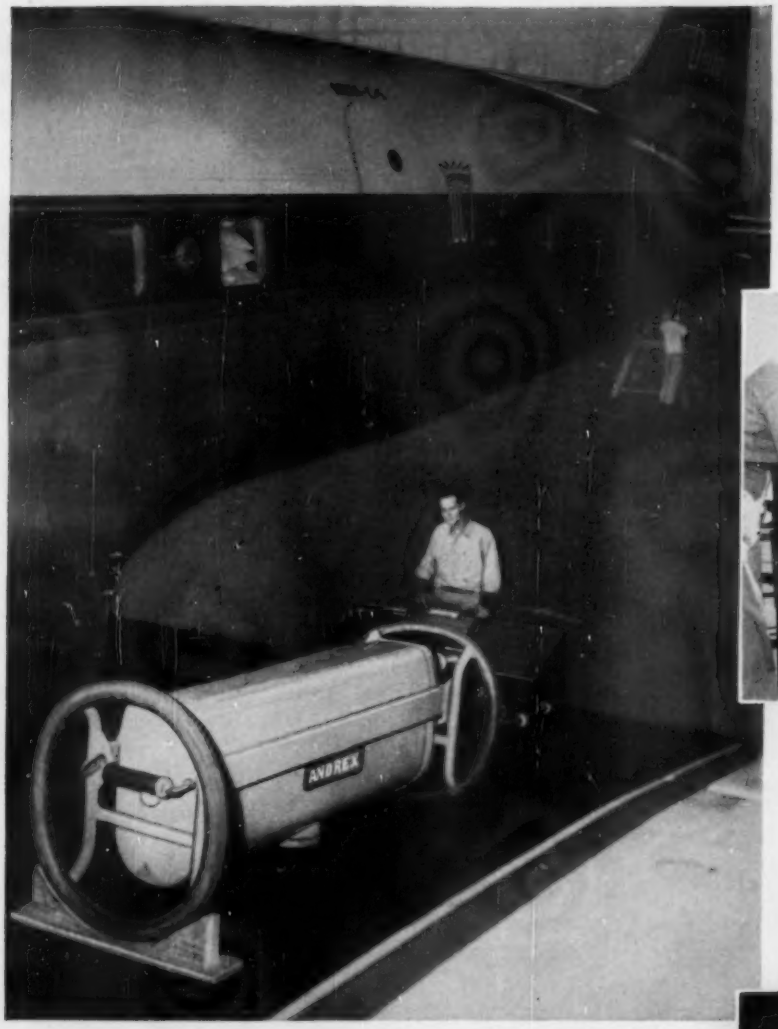
A new titanium forging process, said to make it possible to produce finished precision jet blades as cheaply as rough forgings, has been developed by Canadian Steel Improvement.

The new technique is based on work done by a sister firm, Orenda Engines Ltd., in developing a supersonic successor to the company's Orenda turbojet engine. CSI expects the new process to revolutionize production of the coming generation of supersonic jet engines by removing the barriers to economic use of titanium.

Details are guarded, but it is believed that the new process overcomes the usual problems of titanium production, such as chemical affinity for hydrogen and oxygen, which cause the metal to become brittle and to scale, and often result in distortion during forging of thin sections.

U. S. manufacturers have already ordered the new titanium turbine blades.

Airlines adopt portable ANDREX X-ray for low-cost inspection without disassembly



PAN-AMERICAN WORLD AIRWAYS

8,429 ANDREX x-ray shots taken in 5 month PAA prop inspection. Blades are x-rayed before going into service and at each 1400 hour and 2800 hour interval. PAA uses ANDREX x-ray extensively in engine and fuselage inspection on both heavy structural steel and light metal members.

BRANIFF INTERNATIONAL AIRWAYS

1 hour to inspect leading edge heater duct and attachment clamps and brackets in horizontal stabilizer on DC-6. No disassembly. Approximately 3 feet inspected per each 1 minute exposure. Hidden defects or any serious corrosion caused by leaking gases can be detected at same time.

DELTA-C&S AIR LINES. Wing stringer inspection time cut to 8 hours for entire bottom wing structure from station 421 left to 421 right of DC-7. ANDREX x-ray is replacing visual inspection in general maintenance of entire Delta-C&S fleet. 1000 man-hours alone saved per year by not opening and closing wings.

• *Write for further information* •

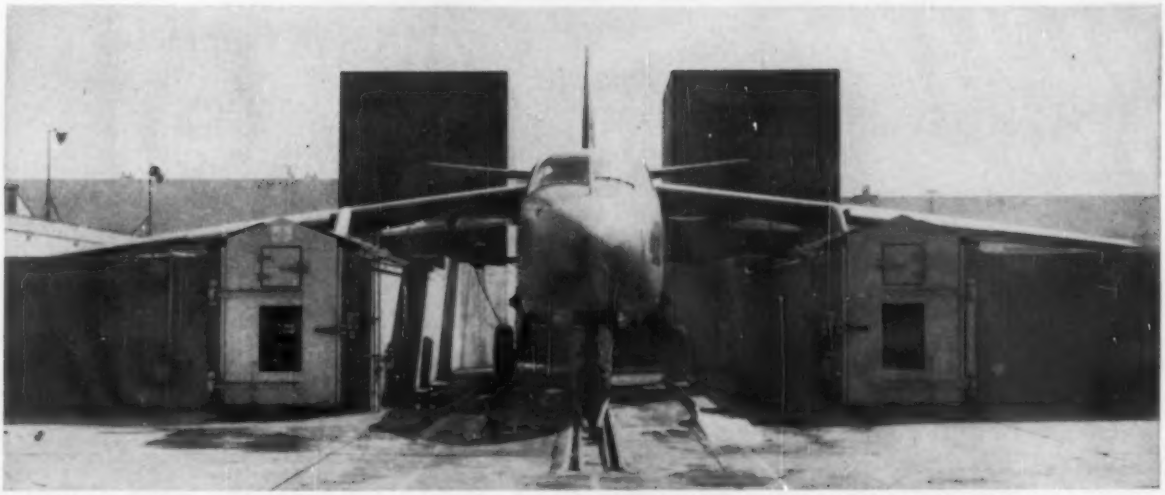
ANDREX X-RAY

PIONEERED, SOLD AND SERVICED BY

HOLGER ANDREASEN, INC.

703 MARKET, SAN FRANCISCO 3, CALIF.

Canadian representatives: Non-Destructive Testing Corp., Ltd., 983 Bay, Toronto 5, Canada

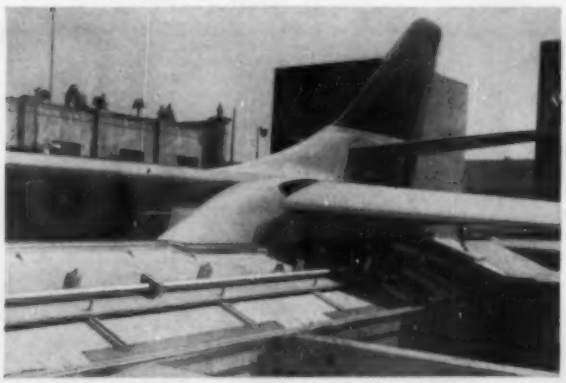


A3D SKYWARRIOR in position in run-up stand at Douglas-El Segundo. Stand is one of a pair built by Kittell-Lacy, Los Angeles. Front door on each nacelle house (structures on each side) contains a viewing window and port for use of fire extinguishers.

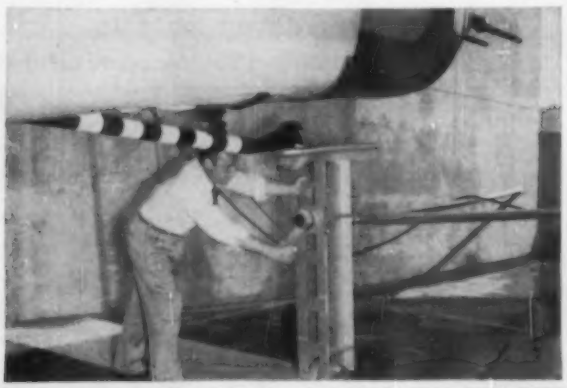
New Installation Silences A3D Run-Ups

TRACKS GUIDE PLANE as tractor backs it into position. The tracks insure that engine pod slides into slot in roof of nacelle house without damage.

J57 IN NACELLE HOUSE. Sliding roof doors close slot during engine run-up.



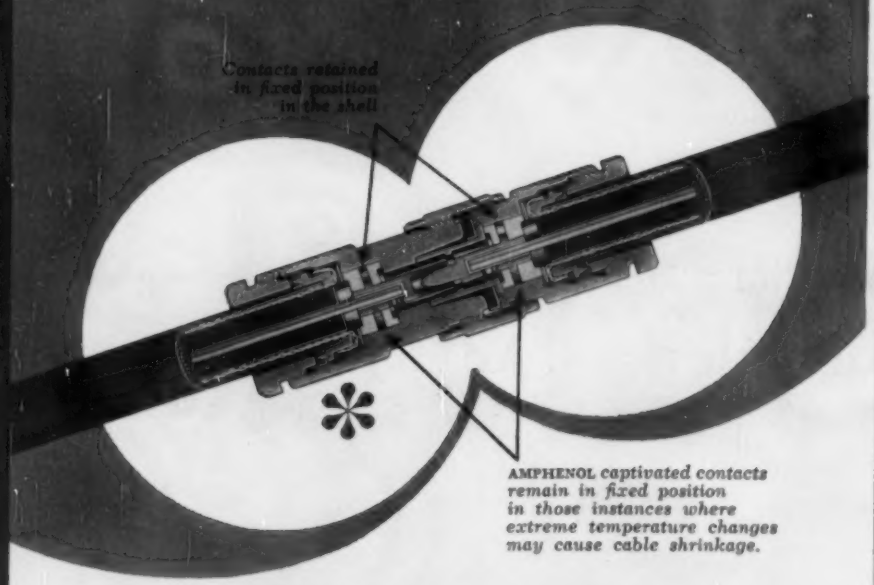
NACELLE HOUSE closeup shows how foam-rubber-edged sliding doors make tight seal against engine pod pylon, blanketing noise of 10,000-lb.-thrust engines. Doors are operated pneumatically.



TIEDOWN ARRANGEMENT engages the A3D's arresting hook to prevent motion of the plane when engines are run. Wheel chocks prevent plane from swinging when only one engine is operated.

NEW! AMPHENOL CAPTIVATED CONTACT

RF CONNECTORS



AMPHENOL captivated contacts remain in fixed position in those instances where extreme temperature changes may cause cable shrinkage.

NEW RELIABILITY. *Captivated contact* RF connectors meet a longstanding need created by the increased use of cable under extreme temperature fluctuations. Teflon dielectric cable, particularly, will 'shrink' under these conditions, causing ordinary connector contacts to pull away. In new AMPHENOL *captivated contact* RF connectors the contact is firmly anchored within the connector shell. Even under great extremes of hot or cold the contacts remain fixed in position, assuring circuit continuity.

Captivated contact RF connectors mate with RG-87/U teflon dielectric cable and RG-8/U, 9/U and 10/U polyethylene dielectric cable. Plugs, jacks and panel jacks are now available in N and HN series.

Send for CAPTIVATED CONTACT PRODUCT BULLETIN *for full information.*

AMPHENOL

AMERICAN PHENOLIC CORPORATION
chicago 50, illinois
AMPHENOL CANADA LIMITED, *toronto 9, ontario*

PATENT PENDING
Captivated contact RF connectors are a totally new design by AMPHENOL. *U.S. Patent is now pending.*

USAF Contracts

Following is a list of unclassified contracts for $25,000 and over as released by Air Force Contracting Offices:

HEADQUARTERS, AMC, Wright-Patterson AFB, Ohio.

Guardian Electric Mfg. Co., 1621 W. Walnut St., Chicago 12, Ill., testers-in-flight controls, spare parts, testers-flight circuit, (PR's 541376 and 541377), $157,620.

General Mills, Inc., Mechanical Div., 1620 Central Ave., Minneapolis, Minn., repair, overhaul and modernization of Y-4 bombsights, (PR 584464), $1,032,371.

Utica Div., Bendix Aviation Corp., Utica, N. Y., type MA-2 combustion starters, spare parts tools and data, (PR PE-673974), $3,783,375.

Sperry Gyroscope Co., Sperry Rand Corp., Great Neck, L. I., N. Y., repair and/or modification of A-1A BNC Systems, assemblies, sub-assemblies and components, (PR 5844536), $1,706,609.

Propeller Div., Curtiss-Wright Corp., Caldwell, N. J., propeller blades for use with Model CT35S-B100 props, (PR 147378-1), $36,976.

Jack and Heintz, Inc., Cleveland 1, Ohio, generators, 30-volt, 400-amp d.c. for QAD mfg flange, type MA-4, P/N 128D, (PR SA-611429), $44,874.

Propeller Div., Curtiss-Wright Corp., Caldwell, N. J., material and services for development and fabrication of airplane prop wiring checking units plus adapting harnesses, (PR 262188), $31,886.

Allen B. Dumont Labs, Inc., 750 Bloomfield Ave., Clifton, N. J., spare parts, (PR 664014), $25,913.

Sperry Gyroscope Co., Sperry Rand Corp., Great Neck, N. Y., MA-2 automatic pilot systems (B-52 installation), MA-2 automatic pilot systems (B-52 spares), MA-2 automatic pilot systems, (Tech trng.), (PR 177982, Amnd. No. 1 & 2), $2,817,205.

Bendix Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, North Hollywood, Calif., radar set, RT-275/APS-42A, 393 ea., radar set, AS-428A/APS-42, 440 ea., SN-59A/APS-42, 557 ea., (PR GE-642751), $2,455,495.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., indicator, hydraulic pressure, synchro style, 2,847 ea., (PR 673550), $89,253.

General Tire & Rubber Co., 1708 Englewood Ave., Akron, Ohio, nose wheel assemblies, spare parts and data, (PR PE 635700), $80,253.

Aerosonic Instrument Corp., 528 Reading Road, Cincinnati, Ohio, indicators, cabin air pressure, pressurized aircraft 1-7/8" dial type MA-1 Spec MIL-I-5099A, (PR 673541), $64,341.

Seaboard Electric Co., 417-421 Canal St., New York, N. Y., 0-5 servo control (component of MH-2 autopilot), F/RF-84F retrofit, spares, spare parts and data, (PR's MO-664829 & MO-664833), $65,305.

Ford Instrument Co. Div., Sperry Rand Corp., 31-10 Thompson Ave., Long Island City, N. Y., product improvement to miniatures, (AN/ASN-6 amplifier engineering drawings) (PR PE 168049), $187,087.

Librascope, Inc., 808 Western Ave., Glendale 1, Calif., stereo ranging device (PR 9617), $111,068.

Benson Manufacturing Co., 18th & Agness Ave., Kansas City, Mo., blade seals, blade covers, (PR 4773), $31,986.

General Electric Co., 11 W. Monument, Dayton, Ohio, generators, aircraft engine driven, 400 amp., 30 volt d.c., (PR PE-672766), $455,907.

Sundstrand Machine Tool Co., Rockford, Ill., drives, constant speed, (PR PE-235859), $1,723,418.

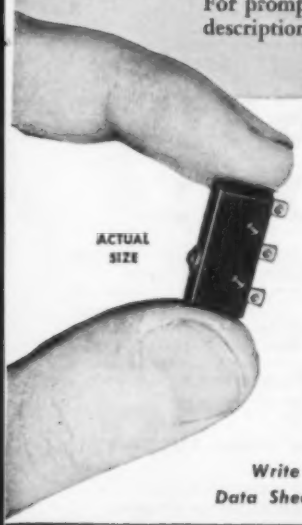
Western Electric Co., Inc., 120 Broadway, New York 5, N. Y., repair and modification of radar sets AN/APS-23 and/or AN/APS-64, ground position indicators AN/APA-44 and plug-ins, (PR's WR-5854533 and WR-584466), $2,795,721.

Electro-Snap Switches Can Be Adapted to Almost Any Job — Quickly, Easily, Economically

Switching Problem?

Just choose the Electro-Snap Basic Switch that meets your electrical requirements, add the proper actuator — and presto! — you have a tailor-made precision switch that exactly fits your application. Electro-Snap makes a wide variety of stock actuators to fit almost any requirement. And our engineering department is at your service if a standard combination "won't fill the bill."

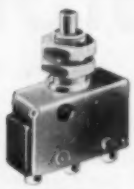
For prompt action on your switching problems, send us a brief description and rough sketch of the switch you need.



SUB-MINIATURE SWITCHES TYPE E-4

S.P.D.T., 1 circuit; 5 amps, 125/250 v. AC Operating force 150 grams max. Exceptionally vibration-resistant. Special model E4-7 is stabilized for — 65° to + 350° F. operation.

Write for Data Sheet EM-2


Push Button Actuator

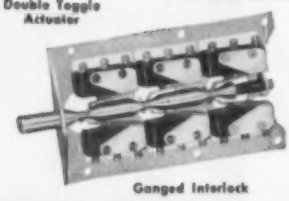
Toggle Actuator (Momentary or Constant Contact)

Double Toggle Actuator

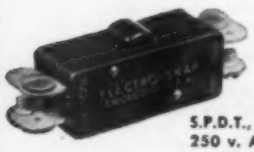
Roller Leaf Actuator

Leaf Actuator

Extension Leaf Actuator

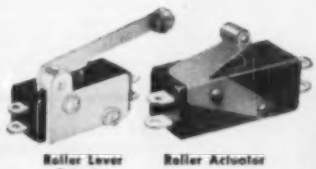

Ganged Interlock

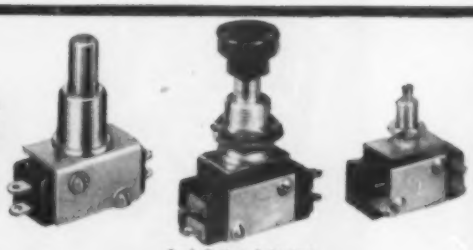
TYPE S SWITCHES Series S1



S.P.D.T., 2 circuit; 10 amps, 125/250 v. AC/ 30 v. DC. Ind. Screw or solder terminals on ends or one side of switch. Also available with reset button at bottom of switch or in Type S-100 Make-Before-Break Series where switch completes a new circuit before interrupting old one.

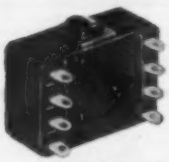
Write for Data Sheet STM-2


Roller Lever Actuator — Roller Actuator


Push Button Actuators (Various button sizes available)

Toggle Actuator (momentary or constant contact) — Extension Leaf Actuator

Special Push Button Actuator designed for fire control system



Write for Data Sheet DM-2

DOUBLE-POLE SIMULTANEOUS ACTION TYPE D-8

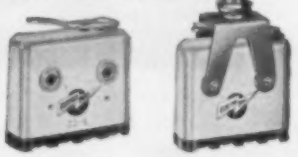
D.P.D.T., 4 Circuit
15 amps, 125/250 v. AC.
10 amps, 30 v. DC Ind.
Eight terminals and four separate circuits which operate simultaneously permit switch to reverse 3-phase motors, replace expensive relays, etc.

Roller Leaf Actuator — Roller Lever Actuator — Leaf Actuator

Extension Leaf Actuator — Push Button Actuators (Various button sizes available)

HERMETICALLY-SEALED DOUBLE-POLE SWITCH

Write for Data Sheet HJM-2


Type J2-4 — Toggle Actuator for J2-4

D.P.D.T., 4 circuit 10 amps, 125/250 v. AC/30 v. DC.

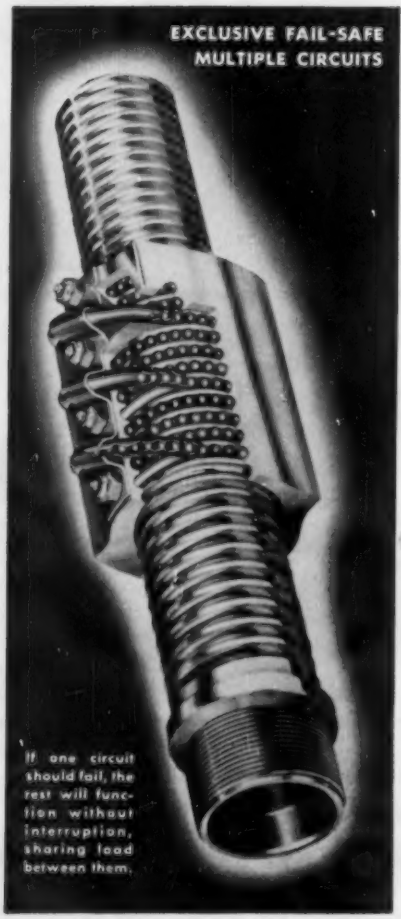
ELECTRO-SNAP SWITCH & MFG. CO. 4220 West Lake Street, Chicago 24, Illinois

MANUFACTURERS OF A COMPLETE LINE OF PRECISION SWITCHES FOR INDUSTRY AND AVIATION

ELECTRO SNAP

NEW SAGINAW b/b SCREW LAUNCHES A PROGRAM OF UNPARALLELED WEIGHT REDUCTION AND RELIABILITY IN . . .

GUIDED MISSILE ACTUATION!


EXCLUSIVE FAIL-SAFE MULTIPLE CIRCUITS
If one circuit should fail, the rest will function without interruption, sharing load between them.

Two of the most critical problems facing R & D engineers are (1) peeling needless pounds off hardware and (2) achieving near-perfect reliability of guidance equipment. That's why they're placing more and more reliance on Saginaw's *Safety ball/bearing Screw* for vital actuation jobs. Free from the limitations of both inefficient Acme screws and bulky hydraulic systems, the *Safety b/b Screw* will function dependably under "impossible" conditions.

Units have been built from 1½ inches to 39½ feet long. Each is individually engineered for its particular application, with the know-how that only Saginaw, *the pioneer producer*, can offer you. Our engineers are ready and eager to help solve your missile actuation problems—*now!*

WHY THE SAFETY b/b SCREW BELONGS IN YOUR MISSILES:

SPACE/WEIGHT SAVINGS INCREASE SPEED AND RANGE

Compared to either Acme screw or hydraulic actuators, the *Safety b/b Screw* saves significant weight and space by permitting the use of smaller motors and gear boxes; eliminating pumps, accumulators, piping, etc.

PERFECT PERFORMANCE AT EXTREME TEMPERATURES

Exhaustive laboratory tests prove that the *Safety b/b Screw* operates dependably at both extremely low and high temperatures, ranging from —90° F to +900° F—within limits of most interior missile environments.

POSITIVE POSITIONING AND SYNCHRONIZATION

Unlike some other types of actuators, the *Safety b/b Screw* permits precision control within thousandths of an inch, plus perfect synchronization of two or more movements—a tremendous boon to aircraft engineers.

FAR LESS DRAIN ON ELECTRICAL SYSTEM

By requiring only 1/3 as much torque as a conventional Acme screw for the same amount of lineal output, the *Safety b/b Screw* allows the use of much smaller motors, which save a substantial amount of power.

DEPENDABLE OPERATION DESPITE LACK OF LUBE

Because the *Safety b/b Screw* is inherently so friction-free (operating at 90% to 95% efficiency) it will function with only a small loss of efficiency *even if lubrication fails or cannot originally be provided*—a vital advantage.

GREATLY DECREASED COMBAT VULNERABILITY

By eliminating highly vulnerable hydraulic lines, accumulators, etc., the *Safety b/b Screw* makes guided missile actuation far more dependable. It also reduces maintenance due to its decreased sensitivity to dirt.

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Safety ball bearing Screw by Saginaw

USAF Contracts

HOLLOMAN AIR DEVELOPMENT CENTER, Holloman AFB, N. M.

Regents of the University of Minnesota, Minneapolis 14, Minn., wind tunnel, investigation of a "ram tunnel," (AF29(600)-791), $91,039.

OFFICE of SCIENTIFIC RESEARCH, ARDC, Baltimore 3, Md.

Washington University, St. Louis, Mo., research, continuation of, paramagnetic resonance, (AF 19(600)-1133), $35,000.

Regents of the University of California, Berkeley, Calif., research, continuation of study of X-ray lattice strain in plastically deformed metals, (AF 18(600)-1022), $43,000.

American Mathematical Society, 80 Waterman St., Providence, R. I., research, monthly abstracts and reviews of current mathematical literature, (AF 18(600)-132), $36,000.

DAYTON AF DEPOT, Gentile Air Force Station, Dayton, Ohio.

Federal Electric Corp., Route 17, Lodi, N. J., provide complete maintenance support of AN/ARN equipments for six (6) month period, 350 ea., PR 553703 and Amend 1, $357,972.

Hoffman Laboratories, Inc., 3761 S. Hill St., Los Angeles 7, Calif., antenna-dipole array type, Hoffman Radio P/N OA117 appl; RT-159/URC-4, 500 ea., technical data (basic), 1 set, technical data (revisions), 1 set, receiver-transmitter sub-assy. tube bracket support, Hoffman Radio P/N AA219 appl; RT-159/URC-4, 200 ea.; technical data (basic), 1 set, technical data (revisions), 1 set, receiver transmitter subassy. tube bracket support, Hoffman Radio P/N AA230 appl; RT-159/URC-4, 250 ea.; technical data (basic), 1 set, technical data (revisions), 1 set, RFP 33-604-56-1313, $29,462.

Leach Relay Co., 5919 Avalon Blvd., Los Angeles 3, Calif., relay-armature, nonpile up type Leach Relay P/N 2069-33F, 100 ea., relay-armature, nonpile up type Leach Relay 9059, 1,800 ea., RFP 33-604-56-1320, $51,996.

Piqua Engrg., Inc., South & College Sts., Piqua, Ohio, relay-assembly AN3025-1 in a/w spec MIL-C-5026 dtd 18 Sep 51, 3,600 ea., overhaul instructions with parts breakdown, 1 set, engineering data, 1 set, engineering data blue line prints, 25 sets, RFP 33-604-56-1392, $62,604.

Varian Associates, 611 Hansen Way, Palo Alto, Calif., tube, electron, receiving klystron, VA-220B in a/w latest comm spec, 3,770 ea.; tube, electron, receiving klystron VA-220-E in a/w latest comm spec, 788 ea.; tube, electron, receiving klystron VA-220-D in a/w latest comm spec, 788 ea., RFP 33-604-55-3353, $454,410.

B. K. Sweeney Mfg. Co., 1601 23rd St., Denver, Colo., tester, torque, contractor's Model #71, 100 ea.; tester, torque, contractor's Model #3, 100 ea.; tester, torque, contractor's Model #75, 100 ea., RFP 33-604-56-1335, $49,033.

Hallicrafters Co., 5th & Kostner Ave., Chicago, Ill., furnish necessary facilities, tools materials and services to accomplish the following: modification of transmitters GFP T-249/APT-6 to T-464/ALT-7 configuration, 90 ea.; pack and dispose of all parts removed from equipment which has been furnished by the government, PR: GE: 557296, $51,351.

Federal Electric Corp., Route 17, Lodi, N. J., maintenance of AN/ARN equipments Ramp testers, 350 ea., PR: GE: 553703, $357,972.

Technology Instrument Corp., 531 Main St., Acton, Mass., resistors, variable, wire wound in a/w Technology Dwg RVI-5DC/1 Rev 1, 200 ea.; resistors, variable, wire wound in a/w Transducer Dwg A133-118 Rev 0, 200 ea.; resistor, variable, linear precision in a/w Link Aviation Dwg 67966, 300 ea.; resistor, variable, linear precision, 100 ea.; resistor, variable, non-linear precision in a/w Link Aviation Dwg 238630 Rev A, 200 ea.; resistors, variable, non-linear precision in a/w Link Aviation Dwg 238632 Rev A, 200 ea.; resistor, variable, non-linear precision Dwg 238634 Rev A, 300 ea.; resistor, variable, non-linear precision in a/w Link Aviation Dwg 238633 Rev A, 300 ea.; resistor, variable, wire wound in a/w Link Aviation Dwg 88293 Rev B, 200 ea., RFP 33-604-55-3491, $68,248.

Cutler Hammer, Inc., 804 Plum St., Cincinnati, Ohio, switches in a/w Dwg AN3027-1, 10,000 ea.; switches in a/w Dwg AN3027-7, 1,000 ea.; switches in a/w Dwg AN3223-1, 50,000 ea.; switches in a/w Dwg ST42E, 2,800 ea.; switches in a/w Dwg ST42G, 3,600 ea., IFB 33-604-56-21, $27,919; switches in a/w Dwg AN3021-1, 10,000 ea.; switches in a/w Dwg AN3022-4B, 3,300 ea.; switches in a/w Dwg AN 3022-15B, 1,200 ea.; switches in a/w Dwg AN-3227-3, 5,000 ea.; switches in a/w Dwg AN3023-7, 1,004 ea.; switches in a/w Dwg ST42-B, 1,000 ea., IFB-33-604-56-21, $28,772.

SAN ANTONIO R&D PROCUREMENT OFFICE, Lackland AFB, San Antonio, Tex.

Psychological Services, Inc., 909 W. Jefferson Blvd., Los Angeles 7, Calif., evaluation of two procedures for armament systems trouble shooting, (Contract AF 41(657)44), job, $41,875.

DAYTON AF DEPOT, Gentile AF Station, Dayton, Ohio.

Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, N. Hollywood, Calif., radar set RCA #554850 appl type No. AN/APS-42A, 150 ea., RFP 33-604-56-1423, 150 ea., $49,048.

American Phenolic Corp., 1830 S. 5th Ave., Chicago 50, Ill., connector, plug P/N 82-312 Stock No. 8850190823, 25,000 ea., 2,736 ea., RFP 33-604-56-1561, $29,435.

Hycon Mfg. Co., 2961 E. Colorado St., Pasadena 8, Calif., multimeter, electronic type A VTVM, 251 ea., RFP 33-604-55-1207, $32,692.

when *your life* depends on it

. . . Flying at 40,000 feet . . . a sudden emergency . . . if you must bail out, the difference between life and death now depends on the instant release of your oxygen and electrical leads. In a split second, these life lines during normal flight can change into a death trap, binding you to your disabled craft or bleeding your portable oxygen supply to atmosphere.

The necessity for providing safe emergency exit from aircraft at high altitudes and trans-sonic speeds is another one of the problems which has been solved through the constant research of the Aerotec Corporation. Aerotec Personal Lead Disconnects give both manual "convenience" operation as well as automatic release at the moment of ejection . . . provide one more unseen helping hand for the pilot.

The Aerotec Oxygen Disconnect and many other aircraft developments are the result of continuing research. Why not let our laboratory help solve your problems?

AEROTEC

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.

(Offices in all principal aircraft centers)

Canadian Affiliates: T. C. CHOWN, LTD., 1440 S. Catherine St. W., Montreal, Que.

THE AEROTEC CORPORATION

Aircraft Division — Greenwich, Conn.

Titeflex

Lightweight flexible hose

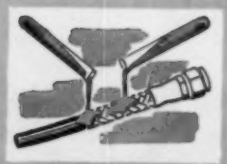
Light—Inner core of Du Pont TEFLON*

Strong—Tough wire braid covering

FLEXIBLE—Meets space-saving requirements

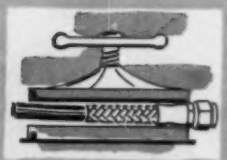
Qualified—Tested to MIL-H-5511

Engineered for the increasing demands and rigid specifications of the aviation industry, TITEFLEX flexible hose, with an inner core of Du Pont TEFLON, provides a practical solution to one of the industry's most critical design problems. Check, for example, these indispensable resistance characteristics.



Resistance to Chemicals. New Titeflex hose is impervious to the corrosive action of synthetic lubricants, hydraulic fluids, salt spray, and is unaffected by fungus.

Resistance to Heat. New Titeflex hose withstands temperatures up to 500°F. Does not soften, deteriorate or change in any way.



Resistance to Pressure. New Titeflex hose is tough—recommended operating pressures range from 600 to 3000 psi.

Resistance to Cold. New Titeflex hose retains its flexibility even at −100°F. Super cohesive—will not crack, chip or cause oil lines to clog.

Available in ⅛" to 1½" sizes. Send coupon for more information on the outstanding advantages of this new hose and its applications in aviation design.

*DuPont trademark for its tetrafluoroethylene resin

Titeflex

FLEXIBLE HOSE

TITEFLEX, INC.
Aviation Products Division
517 Frelinghuysen Ave.
Newark, N. J.

Please mail new literature on Titeflex flexible hose made with an inner core of Du Pont TEFLON. Intended for_____

_____

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

USAF Contracts

Fairchild Controls Corp., 225 Park Ave., Hicksville, L. I., N. Y., potentiometers, Fairchild type 736 a/w Sperry Dwg 708813, revision S, RFP 33-604-56-1024, 1,000 ea., $111,290.

AIR FORCE MISSILE TEST CENTER, Patrick AFB, Fla.

Pan American World Airways, Inc., Guided Missile Range Div., OMU 308 Patrick Air Force Base, Fla., revised specifications and increase in funds to Contract AF 18(600)-881 (P.R. No MTGR-56-1), job, $350,000.

Paul Smith Construction Co., P. O. Box 2866, Orlando, Fla., services and materials for construction of Tacan facility, (IFB 08-606-56-52), job, $39,460.

MIDDLETOWN AIR MATERIEL AREA, Olmsted AFB, Middletown, Pa.

Magnesium Co. of America, 5222 Indianapolis Blvd., East Chicago, Ind., container, aerial delivery, 1,188 ea., $111,672, (RFP PR 597504).

Royal Contracting Co., Inc., 1114 Avenue Y, Brooklyn 35, N. Y., construction of reinforced concrete substructure and associated facilities, Charleston, Me., (IFB PR MANN 56-70-2), $77,800.

Royal Contracting Co., Inc., 1114 Avenue Y, Brooklyn 35, N. Y., construction of reinforced concrete substructures and associated facilities, Caswell, Me., (IFB PR (MAMN) 56-95-1), $92,000.

MEMPHIS AIR FORCE DEPOT, Mallory AF Station, Memphis 2, Tenn.

Machine Products Co., Inc., P. O. Box 352, Aberdeen, Miss., services, Contract AF 40(604)5864, job, $1,156,524.

New Departure Div., General Motors Corp., Bristol, Conn., ball bearings, Contract AF 40(604)5887, 8,550 ea., $16,783.

American LaFrance Corp., Elmira, N. Y., spare parts, RFP 40-604-56-16, 275 ea., $43,537.

Butler Mfg. Co., Kansas City, Mo., spare parts, RFP 40-604-56-28, 6,137 ea., $16,547.

Standard Steel Works, Inc., North Kansas City, Mo., RFP 40-604-56-27, spare parts, 1,446 ea., $16,229.

SHELBY AIR FORCE DEPOT, Wilkins AF Station, Shelby, Ohio.

Victor Equipment Co., 844 Folsom St., San Francisco, Calif., regulator, oxygen, Type C1 IAW Spec MIL-R-6125B, 550 ea., IFB 33-602-56-44 B, $30,305.

Converto Mfg. Co., Inc., 3rd & Green Sts., Cambridge City, Ind., truck, lift, aircraft wing, iaw Lockheed Dwg. No. 884704, 166 ea., bluline prints, (non-reproducible), IFB 33-602-56-18, $25,390.

OFFICE of SCIENTIFIC RESEARCH, ARDC, Baltimore 3, Md.

Ohio State University Research Foundation, Columbus 10, Ohio, research, study of solid nitro aromatic compounds, (AF 18(600)-1371) job, $46,485.

Franklin Institute of the State of Pennsylvania, Philadelphia 3, Pa., research, purification and substructure of metals, (AF 18(600)-1481), job, $34,462.

Board of Trustees of Leland Stanford Jr. University, Stanford, Calif., continuation of research on electron scattering and nuclear structure, (AF 18(600)-646), job, $95,552.

TOPEKA AIR FORCE STATION, Topeka, Kansas.

Pacific Scientific Co., 1430 Grande Vista Ave., Los Angeles 23, Calif., disconnect assy, cable, 4,640 ea., $32,806.

Beatrice Foods Co., 2nd & Polk St., Topeka, Kansas, milk, (IFB-14-604-56-337), 399,300 ctn., $29,503.

American Chain & Cable Co., Inc., 601 Stephenson Bldg., Detroit, Mich., tow line for towing aerial targets, 1,690,000 ft., (IFB-14-604-56-303), $52,052.

Aeroquip Corp., 300 S.E. Ave., Jackson, Mich., fitting end, 13,493,200 ea., (IFB-14-604-56-308), $134,936.

Stratoflex, Inc., Box 10398, Ft. Worth, Texas, fitting end, 271,800 ea., (IFB-14-604-56-308), $71,833.

WRIGHT-PATTERSON AFB, Ohio.

Hughes-Simonson, Inc., 20 North McGee St., Dayton 3, Ohio, furnishing and installing an electrical system for the propeller hub altitude test facility in the propeller control and fatigue research building, Area (B), (AF 33-601-2119), for the job, $286,-904.

HEADQUARTERS AMC, Wright-Patterson AFB, Ohio.

General Electric Co., 41 Federal St., West Lynn, Mass., tachometer indicators, type MS28000-1, spare parts, special tools and data, (PR 673509), $501,742.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., transmitter, rate of flow, type J-2, 400 ea., (PR MA598556), $78,796.

Crosley Div., Avco Mfg. Corp., Milford Road, Cincinnati 15, Ohio, component spares for MD-4 fire control systems, (PR 218500), $204,685.

Stromberg-Carlson Div., General Dynamics Corps., 100 Carlson Road, Rochester, N. Y., receiver R-666/ARN-32, 1,759 ea.; antenna AT-536/ARN-32, 1,759 ea.; spare parts; data, (PR PE-158739 and PE-168047), $436,323.

Goodyear Tire and Rubber Co., Inc., 1144 E. Market St., Akron 16, Ohio, main wheel and brake assemblies, spare parts and data, (PR 636112, 635782, 635779, 636119 and 636110-1), $401,639.

General Tire and Rubber Co., 1708 Englewood Ave., Akron, Ohio, nose wheels, 312 ea., (PR PE635753), $36,698.

Navy Contracts

Following is a list of unclassified contracts of $25,000 and over as released by Navy Contracting Offices:

BUREAU of AERONAUTICS, Washington 25, D. C.

Armour Research Foundation of Illinois Institute of Technology, Technology Center, Chicago 16, Ill., materials & services to conduct an investigation of gamma-phase titanium-aluminum alloys, NOas 55-952-c (AE-41-658-55), $41,790.

Raytheon Mfg. Co., 138 River St., Waltham 54, Mass., furnish field engineering services in connection with the assembling, altering, repairing or operating of electrical and electronic equipment, NOas 56-149-s (MA-35-5518-56), 180 man-months, $218,871.

W. L. Maxson Corp., 460 W. 34th St., New York 1, N. Y., furnish services of 2 qualified factory trained technicians to provide technical assistance and instruction in the maintenance, operation and servicing of gunsight controller, ranging throttle grip and radar range servo, NOas 56-172-s (MA-33-4424-56), $39,556.

Kollsman Instrument Corp., 80-08 45th Ave., Elmhurst, N. Y., periscopic sextants, NOas 56-364-f (PD-42-1286-56), 750 ea., $1,042,762.

AVIATION SUPPLY OFFICE, 700 Robbins Ave., Philadelphia 11, Pa.

Berger Bros. Co., 135 Derby Ave., New Haven 7, Conn., anti-blackout suits, (IFB 1383-351-56), 5,700 ea., $221,103.

Wilbur B. Driver Co., 1875 McCarter Highway, Newark, N. J., steel wire, (IFB-393-174-56), various, $51,748.

United States Gauge Div., American Machines & Metals Inc., Sellersville, Pa., indicator, (IFB-383-332-56), 654 ea., $25,898.

New Jersey Zinc Sales Co., 160 Front St., New York 38, N. Y., pigment, (155/180006 F/56), 189,000 lb., $33,585.

Henry Spen & Co., Inc., 1995 Pitkin Ave., Brooklyn 7, N. Y., spare parts for oxygen trailer, (383/29065-4283/24/56), various, $184,100.

Cornelius Co., 550 39th Ave., N. E., Minneapolis 21, Minn., compressor assy., (383/2110-173/54, 383/2110-33/55), 49 ea., $40,254.

Hewlett-Packard Co., 275 Page Mill Rd., Palo Alto, Calif., frequency converter, (383/29069-9-E-2/6/56), 220 ea., $58,249.

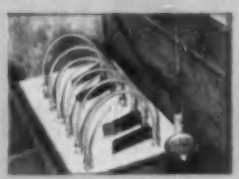
Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., transmitter, (383/2120-532X6/3/52), 309 ea., $28,638.

...to meet

aviation hose requirements

Chemical Resistant
Withstands Very Low Temperatures
Operates at High Temperatures or Pressures
Sizes—¼" to 1¼"—Standard Fittings

Titeflex's new aviation hose (with inner core of Du Pont TEFLON*) was developed by our research engineers working closely with jet-engine designers. This hose meets or exceeds standards set by jet engine manufacturers. We maintain these standards through a rigid quality control system and a fully rounded engineering service.



Rigid Testing. Sample Titeflex hose lines set up for impulse-test cycling from 75-2500 lbs. psi. This is a MIL-H-5511 test.

Quality Control. View of Titeflex quality control laboratory where raw materials and other components are inspected for uniformity.

Engineering Service. If you are looking for design ideas and adaptation of Titeflex aviation hose our highly skilled engineers are at your service.

Customer Service. Trained Titeflex sales engineers work directly with you to help you find the right answers to your aviation hose problems.

Mail coupon to obtain more detailed information on this new type Titeflex flexible aviation hose with an inner core of durable, chemically inert and heat-resistant TEFLON.

*Du Pont trademark for its tetrafluoroethylene resin

Titeflex

FLEXIBLE HOSE

TITEFLEX, INC.
Aviation Products Division
517 Frelinghuysen Ave.
Newark, N. J.

Please mail new literature on Titeflex flexible hose with an inner core of DuPont TEFLON. Intended for_____

Name_____

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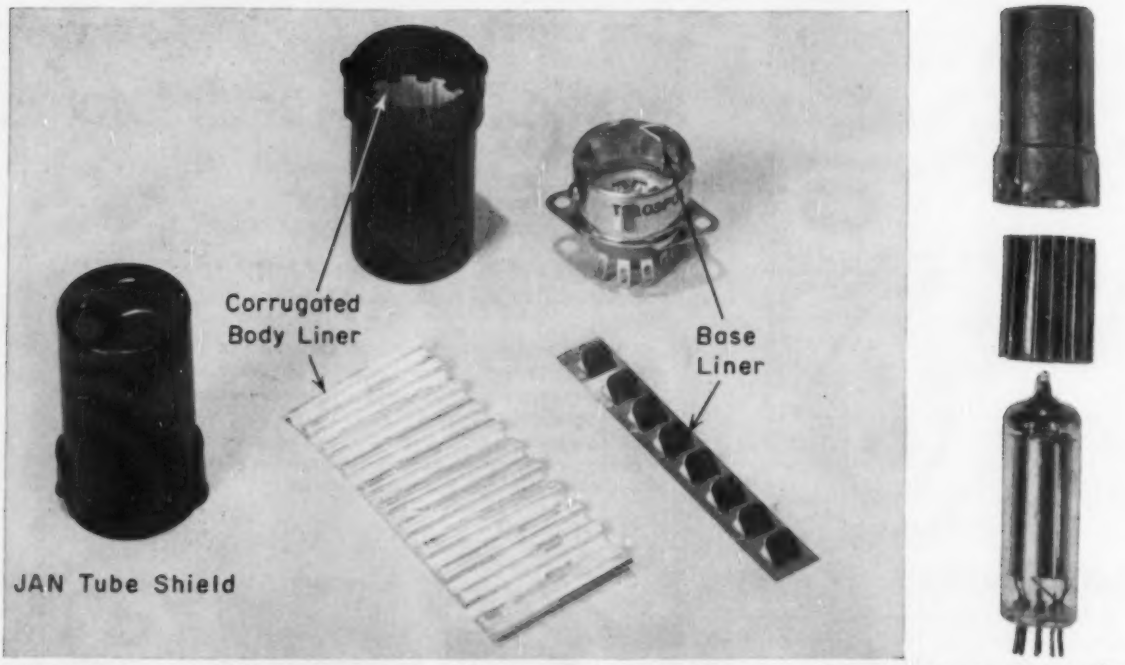
Address_____

City_____ Zone_____ State_____



NEW LOW-COST inserts for JAN tube shields, developed by Collins Radio (left) and by the Navy Electronics Laboratory (right), reduce temperature by 50%.

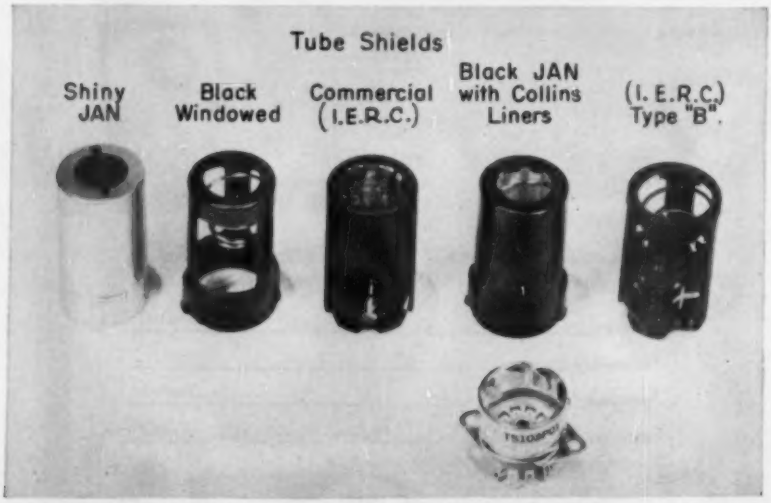
New Shield Insert Reduces Tube Heat

By Philip J. Klass

Tube failures in existing avionic equipment can be reduced by a simple new device now coming on the market. The unit, a corrugated metal liner that can be inserted quickly in a standard miniature JAN (Joint Army-Navy tube shield, reduces tube operating temperatures by as much as 50%).

The new liners are going into much of the Navy's existing electronic gear and may be made mandatory for all existing military equipment within six months.

The liners are presently available in two similar models: one developed by the Navy Electronics Laboratory at San Diego, the other by Collins Radio Co.



COLLINS RAN comparative tests on variety of shields. For results, see graph, p. 87.

The NEL type insert is, or shortly will be, available from a number of companies, including Atlas E-E Corp., Birtcher Corp., Cinch Manufacturing Co. and International Electronic Research Corp. (IERC).

Collins plans to market a complete JAN-type shield equipped with inserts and, so far, has not licensed any other firms to its design.

Provides Conduction Path

A conventional JAN shield traps a layer of insulating air between the tube's glass envelope and the shield and provides no direct conduction path for getting rid of tube heat. When the NEL or Collins liner is inserted in the shield, it grips the tube, providing a direct conduction path to the shield, and through the shield base to the chassis.

The most significant difference between the NEL and Collins designs is that the latter uses both an insert for the shield and another one for the shield base (see photo above). Collins tests indicate that the base liner drops the temperature of the lower portion of the tube glass envelope by 8-10 degrees Centigrade.

The Collins shield insert is made of heat-treated beryllium copper and silver, to provide both resilence and good con-

ductivity. The NEL-type liners are made of 0.003-in. brass shim stock, and are given a black cadium-plate finish.

Better, But Not Best

NEL tests indicate that the new inserts do not drop tube temperatures as much as the heat dissipating shield made by IERC (AW Dec. 14, 1953, p. 62). This unit, adopted by the USAF (Type B), is being considered for adoption as a MIL standard for use in new equipment.

The IERC Type B shield provides convection cooling in addition to a better conduction path from the shield to its base. However, it is not directly interchangeable with JAN shields on existing equipment, because of its special base.

NEL is therefore recommending that all new equipments under design should use the IERC Type B shield, but that all existing equipments now in service should be equipped with the new liners.

IERC recently brought out a modified version of this shield, called Type A, which can be used as a direct JAN shield replacement, making it suitable for retrofit. It is less efficient in heat dissipation than the original Type B.

Reliability Pay-Off

Positive evidence that the new shield liners pay off in much-improved tube reliability is cited by Collins' H. M. Passman. For instance:

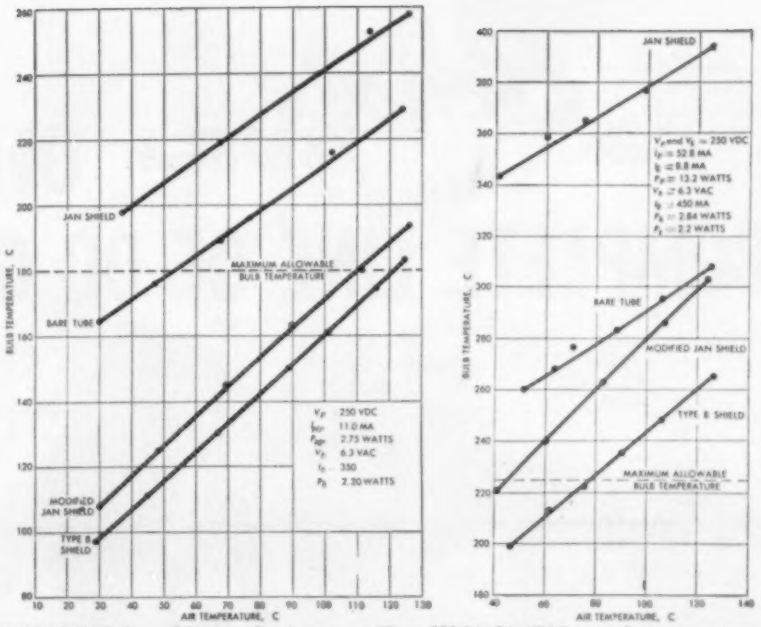
• **90% increase in survival rate** of Type 6005 tubes operated for 2,000 hours at room temperature ambient (25C), below their maximum plate dissipation rating. After 2,000 hours, only 10% of the tubes equipped with conventional shiny JAN shields had survived, whereas 90% of those equipped with a Collins shield and base liner were still operating satisfactorily. Maximum hot spot temperature was reduced from 300C to 200C, Passman reports.

• **100% of Type 5654 tubes** equipped with Collins liners survived 200 hours operation in the radio rack of a commercial airliner (in 50C ambient), whereas only 94% of the same tubes without liners lasted through the same 200-hour run.

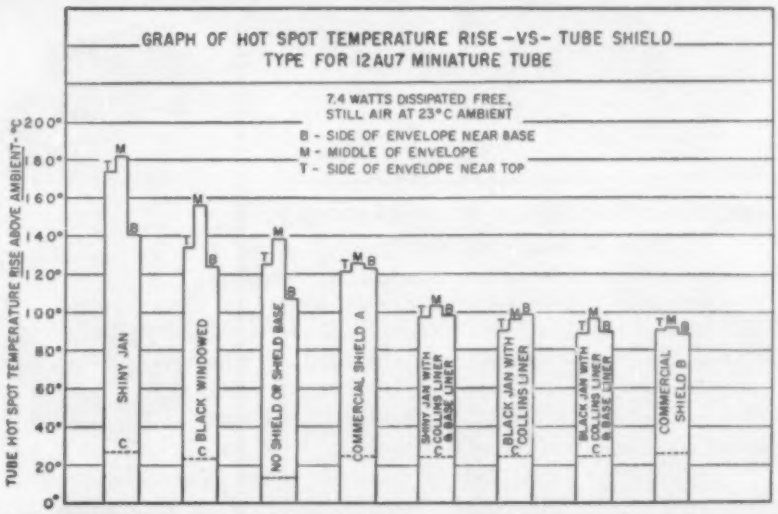
Test Results Differ Slightly

NEL and Collins have run extensive tests to check the effectiveness of their respective shield liners against other shield configurations. Although both tests offer proof that the new liners are extremely effective, they differ slightly in the degree of improvement indicated – probably the result of slightly different test set-ups and procedures.

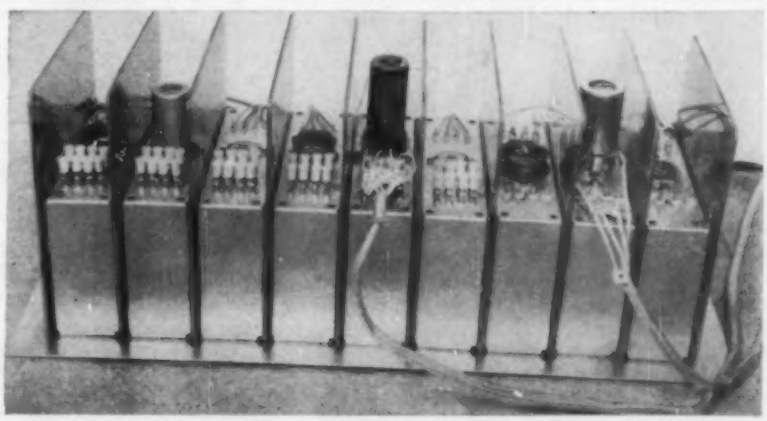
NEL ran tests on a number of different miniature tube types, comparing tube hot-spot tempratures with JAN,



NAVY TESTS showed liner's effectiveness on Type 5814A (l.), 6005 (r.) tube temperatures.

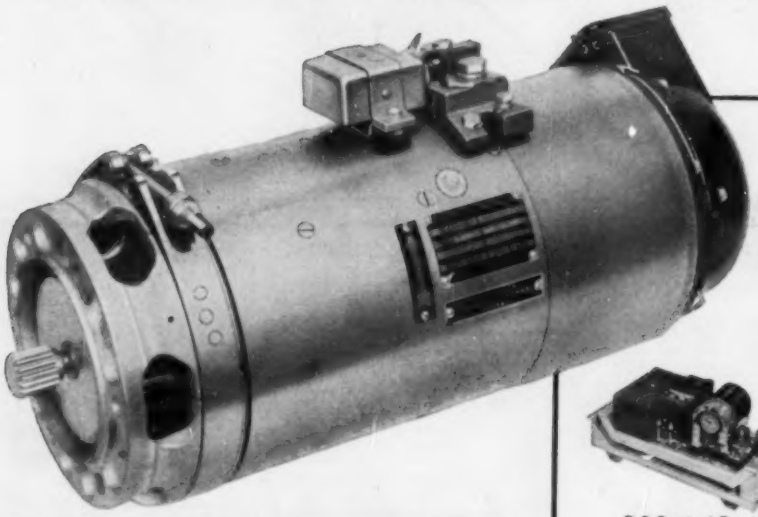

GRAPH OF HOT SPOT TEMPERATURE RISE –VS– TUBE SHIELD TYPE FOR 12AU7 MINIATURE TUBE
7.4 WATTS DISSIPATED FREE, STILL AIR AT 23°C AMBIENT
B - SIDE OF ENVELOPE NEAR BASE
M - MIDDLE OF ENVELOPE
T - SIDE OF ENVELOPE NEAR TOP
TUBE HOT SPOT TEMPERATURE RISE ABOVE AMBIENT - °C
SHINY JAN
BLACK WINDOWED
NO SHIELD OR SHIELD BASE
COMMERCIAL SHIELD A
SHINY JAN WITH COLLINS LINER & BASE LINER
BLACK JAN WITH COLLINS LINER
BLACK JAN WITH COLLINS LINER & BASE LINER
COMMERCIAL SHIELD B

COLLINS RESULTS show bulb hot-spot temperature rise of variety of shield configurations.



COLLINS tested various shields, separated by phenolic baffles, on aluminum chassis.

Bendix Red Bank OFFERS A COMPLETE LINE OF DC GENERATORS

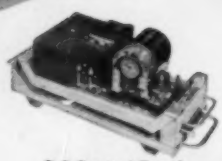


AIRCRAFT-ENGINE-DRIVEN DC GENERATORS FOR 30 VOLT SYSTEMS

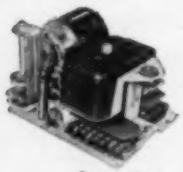
Type No.	Nominal Rating			Approx. Weight Lbs.	Designed to Gov't Spec.
	Amps.	Speed Range RPM	Altitude Ft		
30E01	50	2200-4500	20,000	24	M-2, M-3
1345	50	4000-8500	30,000	14.25	
30E22	50	4000-8500	30,000	16.25	
30E14	75	4000-8000	25,000	24.5	N75-2RA
30E16	100	2500-4500	50,000	40	5286588
30E20	150	4000-8000	65,000	45	
30E17	200	2870-8600	Ground Power	40	
30E07	200	3000-8000	50,000	45	AN-3632
30E18	200	4000-8000	50,000	38	MS-25009
30E19	250-350	1600-7500	Ground Power	98	
30E02	300	3450-8500	25,000	64	
30E15	300	4000-8000	50,000	50	AN-3623
30E05	400	3000-8000	50,000	68	AN-3634
30E10	400	3100-8000	60,000	67	AN-3624
30E11	500	4000-8000	50,000	75	
30E13	500	3500-8000	50.000	86	

WITH a full line-up of DC Generators, together with all the protective and control equipment to go with them, Bendix Red Bank can supply the most efficient answer to your DC system needs. Whether for use on new or on existing aircraft, Red Bank DC units are designed for maximum reliability, minimum size and weight, and maximum installation and servicing ease. For complete information, write RED BANK DIVISION, BENDIX AVIATION CORPORATION, EATONTOWN, N. J.

PLUS THIS PROTECTIVE AND CONTROL EQUIPMENT FOR DC SYSTEMS

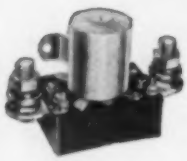


B-3 Control Panel

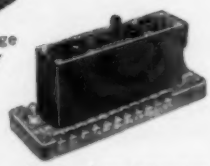


Generator Control Panel

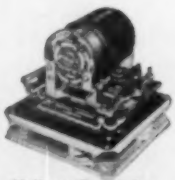
Overvoltage Protector



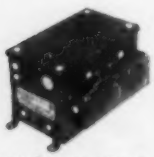
Line Relay



Feeder Circuit Breaker



Voltage Regulator



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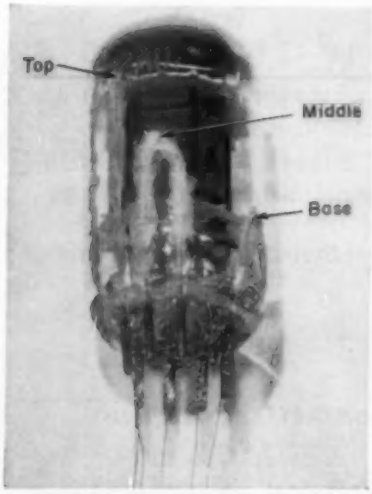

THERMOCOUPLES were installed at three locations on tube to check temperature.

liner-equipped JAN, USAF Type B shields, and with no shield.

Collins checked a larger variety of shield combinations, including: shiny JAN, black JAN with ventilation windows, shiny JAN with Collins liner and base insert, black JAN with shield liner only, black JAN with shield liner and base insert and the two IERC shields. In its test results, Collins identifies the IERC (USAF) Type B shield as "Commercial Type B," and the more recent IERC JAN-replacement as "Commercial Type A."

NEL Test Results

Tests at NEL revealed that whereas a conventional JAN shield always raises tube hot-spot operating tempratures above that of a bare (shield-less) tube, the addition of an NEL liner drops the temperature appreciably below that of a bare bulb.

In some instances, depending upon the tube type, its power dissipation and whether it normally operates at a very high temperature, the temperature reduction achieved by the NEL liner approached that obtainable with the IERC Type B. In other cases, the IERC Type B appeared to offer appreciable further reduction in tube temperature.

NEL tests on Type 5814A tube operated with a plate dissipation of 2.75 watts per plate, in a surrounding air temperature of 70C, had a maximum hot-spot temperature rises of:

- 150C rise with a JAN shield.
- 120C rise with no shield.
- 76C rise with insert-equipped JAN shield.
- 63C rise with IERC Type B shield.

Thus by merely inserting the NEL liner the maximum hot-spot temperature rise was slashed approximately 50%. The advantage of the IERC Type B is

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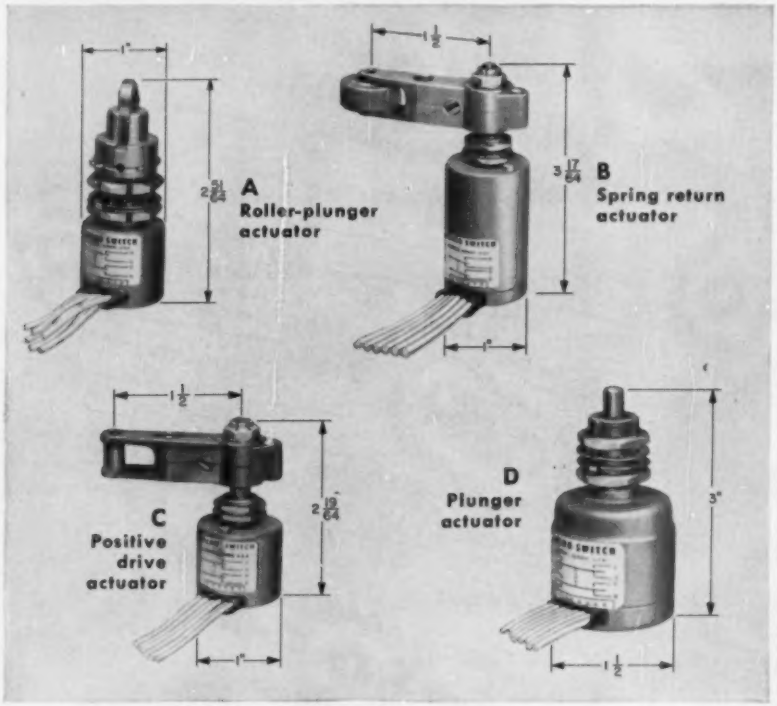

These small, completely sealed, cylindrical switches provide unusual design flexibility

Here are four examples of a family of MICRO SWITCH environment proof switches that provide unusual flexibility for aircraft designers.

With them MICRO SWITCH introduces an entirely new concept in airborne switches. The switches are small, completely sealed, cylindrically shaped and of high electrical capacity. They are ideal for use on landing gears, flaps and other exposed locations. They are equal in performance and have more versatility of application than switches several times their size and weight.

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The switches are designed for bracket type, or through-hole mounting. Leads are supplied, one for each terminal, the number depending on contact arrangements and terminals. The leads project at a 90 degree angle from the base of the switch. They may be run in any direction by rotating the switch on its axis.

The switch type designated as (A) has a roller-plunger actuator for actuation by cams or slides; (B) has a spring return actuator also for cam or slide operation; (C) has a positive drive actuator for linkage operation; the type designated as (D) is designed with a plunger actuator for in-line-motion operation.

For complete information on these new cylindrical switches, types of actuators available and circuitry developments, contact MICRO SWITCH Engineering Service at your nearest branch office. Let them show you the complete line of environment proof, hermetically sealed switches for severe airborne service. It pays to bring your switch problems to MICRO SWITCH.

Choice of Contact Arrangements and Electrical Ratings

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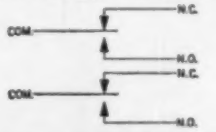


CONTACT ARRANGEMENT

Two single-pole, double throw circuits

ELECTRICAL RATING at 28 volts D-C (in unsealed condition)*

INRUSH

Normally-closed, 24 amperes
Normally-open, 24 amperes

AT SEA LEVEL

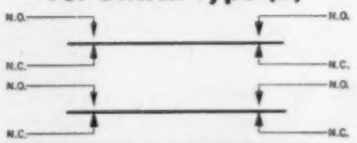
Resistive, 4 amperes
Inductive, 3 amperes
Motor, 4 amperes

AT 100,000 FT.

Resistive, 4 amperes
Inductive, 2 amperes
Motor, 4 amperes

**Electrical ratings established with tests on unsealed switches.*

For Switch Type (D)



CONTACT ARRANGEMENT

Two double-pole, double-throw circuits

ELECTRICAL RATING at 28 volts (in unsealed condition)*

INRUSH

Normally-closed, 30 amperes
Normally-open, 30 amperes

AT SEA LEVEL AND AT 100,000 FT.

Resistive, 15 amperes
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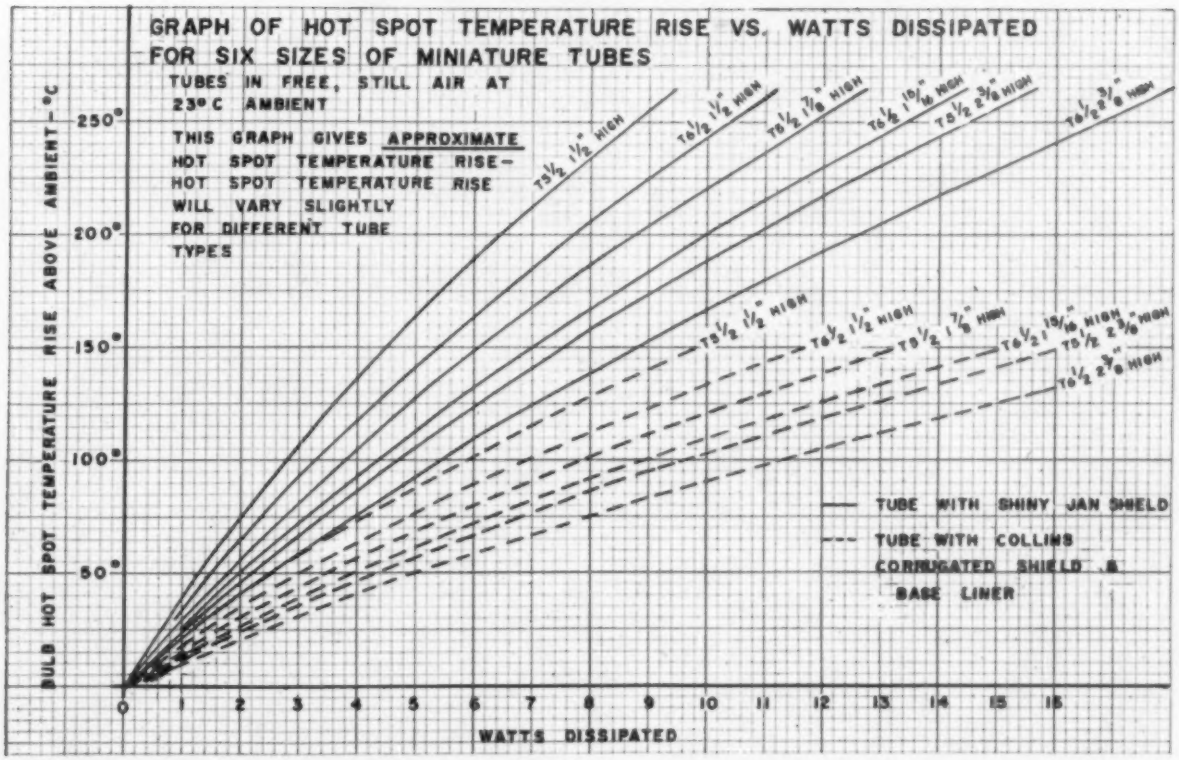
GRAPH OF HOT SPOT TEMPERATURE RISE VS. WATTS DISSIPATED FOR SIX SIZES OF MINIATURE TUBES
TUBES IN FREE, STILL AIR AT 23° C AMBIENT
THIS GRAPH GIVES APPROXIMATE HOT SPOT TEMPERATURE RISE— HOT SPOT TEMPERATURE RISE WILL VARY SLIGHTLY FOR DIFFERENT TUBE TYPES
BULB HOT SPOT TEMPERATURE RISE ABOVE AMBIENT—°C
250°
200°
150°
100°
50°
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
WATTS DISSIPATED
T5½ 1½" HIGH
T6½ 1½" HIGH
T6½ 7/8" HIGH
T6½ 1 15/16" HIGH
T5½ 2 3/8" HIGH
T6½ 2 3/8" HIGH
TUBE WITH SHINY JAN SHIELD
TUBE WITH COLLINS CORRUGATED SHIELD & BASE LINER

HOT-SPOT TEMPERATURE of miniature tubes in 23C ambient air can be determined approximately from this nomograph prepared by Collins Radio Co. Solid lines show temperature for shiny JAN shield enclosed tubes; dotted lines for JAN shields equipped with Collins heat dissipating liners. More accurate hot-spot temperature measurements on specific tube types require special test set-ups.

more apparent in a tube such as the 6005 when it operates in a higher temperature ambient. For example, when the 6005 is operated in 120C ambient air, with a plate dissipation of 13.2 watts, NEL tests revealed the following hot-spot temperatue rises:

- 270C rise with a JAN shield.
- 185C with no shield.
- 180C with insert-equipped shield
- 140C with IERC shield.

Collins Test Results

In order to measure the effect of its shield base insert, Collins made temperature measurements at three points on the tube envelope.

Thermocouples (No. 4 gage copper-constantan) were embedded in the envelope at the top, middle and bottom portions of the glass surrounding the tube's electrode section. The eight different types of shield arrangements were then mounted on an aluminum chassis, each separated by a ½-in. phenolic baffle. This permitted natural convection cooling, but prevented radiation between adjacent tubes.

A graph plotting tube hot-spot temperature rise versus tube shield type is shown on p. 87 for the type 12AU7 miniature tube type. Temperature rise is shown for the three locations along the glass envelope. This graph reveals the maximum temperature rises to be as follows:

- 181C rise for shiny JAN shield.
- 155C for black "windowed" JAN shield.
- 138C with no shield or shield base.
- 125C with IERC Type A (JAN replacement).
- 104C for shiny JAN with Collins shield liner and base insert.
- 99C for black JAN with Collins shield liner only.
- 96C for black JAN with Collins shield liner and base insert.
- 92C for IERC Type B (USAF Type B).

With a number of firms moving into the field of manufacturing NEL liners, the competitive situation is keen and the price picture is fluid. However, it is clear that the NEL liner itself represents a low-cost addition to any avionics equipment.

In a recent Navy competition for procurement of several hundred thousand NEL shield liners, prices quoted ran from 1¼ to 22½ cents each, AVIATION WEEK has learned. IERC says its liners will sell for "under 10 cents each" in production quantities. Atlas E-E Corp. is quoting 25 cents each in lots of 100; 5.6 cents each in quantities of 500,000. Cinch Manufacturing Co. reportedly won the Navy competition with a price of 1¼ cents each.

Collins Radio plans to sell a complete black JAN shield and base, both equipped with liners, for approximately 50 to 60 cents, although firm prices are not yet established, a spokesman tells AVIATION WEEK.

By way of comparison, the IERC Type B shield sells for around $1.50 (including base) in quantities of more than 500, while its JAN replacement Type A sells for around 50 cents in quantities of 8,000 or more.

Note of Caution

Although the NEL liner can be used with existing shiny JAN shields, some observers question whether the in-

Motor Cooling Too

The corrugated brass liner material used in the new tube shield inserts is also attractive for cooling small servo motors and other devices which run hot.

Some avionics manufacturers are wrapping the corrugated material around servo motors, thereby increasing the radiating surface by 50%, according to A. Q. Mowatt of Atlas E-E Corp., one of the firms now making the corrugated liners.

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creased shield temperature will cause its tube-restraining spring to lose resilience, making it less effective under airborne shock and vibration. These observers believe that it may be better to replace the JAN shields with a black heat dissipating shield (IERC Type A or black JAN with insert liner), to enable the shield better to radiate its heat to the surrounding air.

Collins' Passman also notes that the addition of the insert may produce some slight circuit de-tuning, because the shield is effectively brought closer to the tube elements. However, once the circuit is returned, it should be less affected by shield movement than with a standard JAN shield, Passman believes.

The patent situation in the field of heat-dissipating tube shields and inserts can best be described as "confused." IERC, a pioneer in the field for miniature type tubes, believes that its basic patent (now pending) covers the new NEL and Collins-type insert, because both employ a similar means of conducting heat from the tube to the shield.

The Government reportedly is filing for a patent on the NEL liner. Collins Radio says that it has been using corrugated shield liners "on certain production equipments since 1952" and adds that it has filed for a patent.

Addresses of announced producers of the new shield inserts include: Atlas E-E Corp., Bedford Airport, Bedford, Mass., Birtcher Corp., 4371 Valley Blvd., Los Angeles 32, Calif., Cinch Manufacturing Co., 1026 S. Homan Ave., Chicago 24, Ill., Collins Radio Co., Cedar Rapids, Iowa, and International Electronics Research Corp., 177 West Magnolia Blvd., Burbank, Calif.

FILTER CENTER

▶ **Tacan Gets Reliability Treatment**—Navy is subjecting its airborne Tacan receivers to one of the most grueling series of tests and reliability improvement programs ever attempted for avionics equipment. Modifications suggested by these tests have so improved Tacan reliability that some observers believe the units may end up being among the most reliable equipments in the fleet.

▶ **Canada's First VOR**—First Canadian omnirange station has been put into operation at Dorval Airport, Montreal. The VOR, and others to follow, are manufactured by Canadian Aviation Electronics, Ltd.

▶ **Portable Transistor Tester**—With more transistors finding their way into avionics equipment, field engineers will

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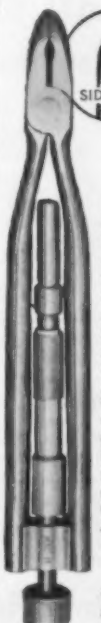

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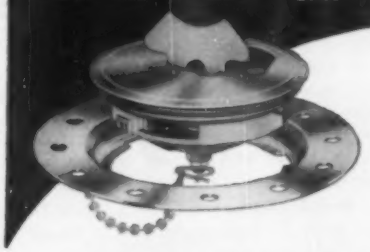

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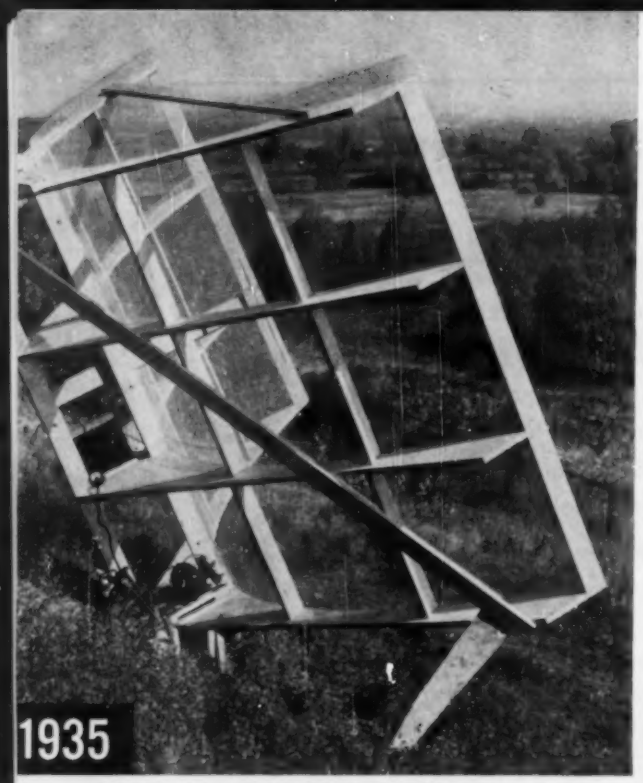

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The recent instance in which a Northeast Air Lines Convair lost all power shortly after takeoff in a blinding snow storm at Boston, depriving the pilot of any communications, points up a need which a little avionics industry ingenuity could easily solve.

Newly available high frequency transistors should make it possible to build a tiny transistorized VHF receiver, permanently tuned to the emergency (121.5 mc.) channel, and containing its own battery supply. Such a unit should not weigh more than a couple of pounds, and would take up little cockpit room. It could enable the pilot to obtain instructions from the ground, as well as establish his position from ground radar reports.

At the penalty of only a few more pounds, it should be possible to build a flea-power VHF transmitter, also tuned permanently to 121.5 and with its own batteries, to enable the pilot to make occasional air-to-ground transmissions.

The obvious hazard of an aircraft, uncertain of its position, without identification lights or communications, in a high density area could be at least partially eased with such an emergency VHF equipment.

welcome a new portable transistor tester developed by General Electric. The device, about the size of a pocket radio, checks all junction transistors for short circuits, opens, leakage and current gain. Tester, priced at $39.95, is available from GE's Electronics Division, Syracuse, N. Y.

▶ **'Hot' Tubes**—"Operation Teapot," the nuclear tempest at Yucca Flats, Nevada, caused no ill effects on General

Electric receiving tubes recovered from the radioactive rubble, the company reports. GE does not say how close the tubes were to the blast.

▶ **Pye in the Sky**—Pye Ltd., British avionics firm, recently demonstrated use of its industrial television for aerial reconnaissance, with a TV camera and transmitter installed in a Bristol helicopter and the picture displayed on the ground. Airborne equipment weighed about 400 lb.

▶ **Navy Seeks Standardized Cooling**—Navy Bureau of Aeronautics has asked its airframe suppliers to come up with recommendations for cooling avionics modules, with the objective of adopting a "preferred design" for its future equipments. BuAer also hopes to standardize on module sizes for its CNI (Communications-Navigation-Identification) packages.

▶ **Airlines Eye New Radio Altimeters**—There appears to be growing interest among the airlines, particularly overseas carriers, for a new improved high-altitude radio altimeter for use in new jetliners. Present RCA AVQ-9 radio altimeter reportedly is not adequate above 25,000 ft. One airline is seeking altimeter accurate to within 100 ft. at 40,000.

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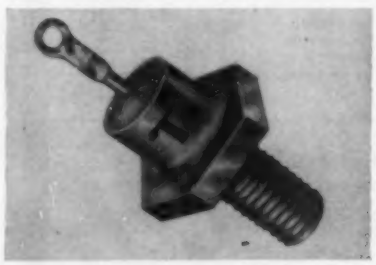

also reports it is now producing silicon power rectifiers with 500 and 600 volt peak inverse ratings, with forward current capacities of 400 ma. at 100C. Units occupy less than ¼ cu. in. Bulletin TE-1335 gives application data. Transitron Electronic Corp., Melrose 76, Mass.

• **Silicon NPN grown junction transistors** are now available in eight different types in production quantities from a new supplier, Germanium Products Corp., a subsidiary of Bogue

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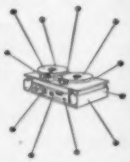

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Davies equipment lends itself best to reproduction of data in graphic form on oscilloscopes, oscillographs, direct-writing recorders, X-Y recorders, and many others.

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Davies reproducing equipment permits change of time and frequency scales of magnetic tape recorded data to fit analog recorders . . . permits recording of digital computer output for fastest operation of line tabulators simultaneously.

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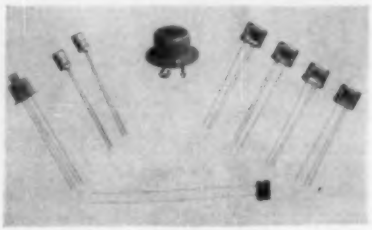
Electric Manufacturing Co. Types available include: 2N160, a medium-gain unit for military use; 2N161, a general purpose transistor; 2N162, for high frequency and high power gain; and 2N163 for very high current gain applications. Four other models, similar to those described and with the same designation, except for an "A" (2N160A, etc.), are designed to handle larger signals. Complete specs are available by writing company at 52 Iowa Ave., Paterson 3, N. J.

• **Semiconductor devices,** including point contact transistors, junction transistors, power transistors, phototransistors and silicon junction varistors, previously manufactured by Western Electric only for the Army Signal

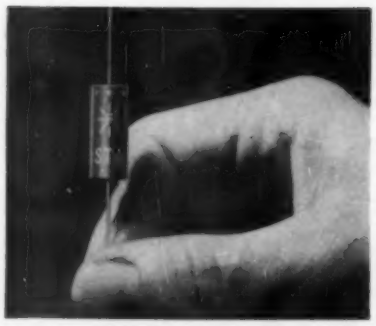


Corps, will now be available to other government agencies and government contractors. Data sheets are available from Western Electric Co., Radio Div., Electronics Products Dept., 120 Broadway, New York 5, N. Y.

Components & Devices

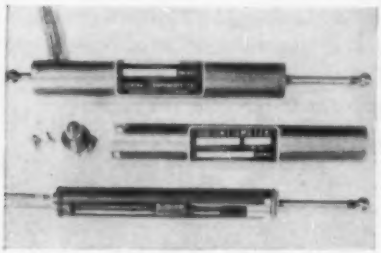
• **Thermal time delay relay,** called "Red Dot Series," comes in sealed container with octal tube base, in a variety of standard delay times from 2 to 180 seconds. Standard heater voltages are 6.3, 26.5, 115, and 230, a.c. or d.c. Units have SPST contacts, rated 3 amp. at 230 v. a.c., either normally open or closed. G. V. Controls Inc., 28 Hollywood Plaza, East Orange, N. J.

• **New STA type tantalum capacitor** employs a solid electrolyte, eliminating leakage and corrosion problems, accord-



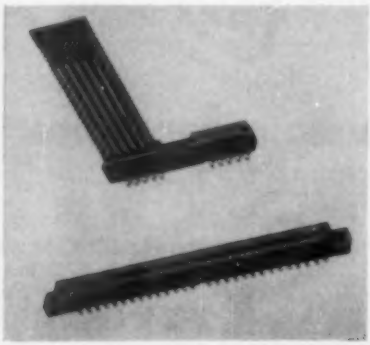
ing to manufacturer. Unit can be operated at temperatures of −70C to 85C and is particularly stable at low temperatures. The unit is said to operate better than conventional electrolytic capacitors at high frequencies. Fansteel Metallurgical Corp., Rectifier-Capacitor Div., North Chicago, Ill.

• **Miniature linear pot,** with single or dual potentiometers, comes in a ½-in.-dia. case. Total travels up to 6 in. and resistances up to 60,000 ohms per inch



are available. Each pot has dual wipers and resolution can be as low as 0.0008 in. with single turn taps. General Components Co., 801 Eighth St. S.E., Minneapolis 14, Minn.

• **Printed circuit receptacle,** Model PCSC28, provides connections to printed circuit board with 28 contacts. Center barrier provides extra strength and prevents warpage, manufacturer states. Double row receptacle is available to provide 56 connections. Another model, PCB20, provides two sets of five double-row contacts. Units can



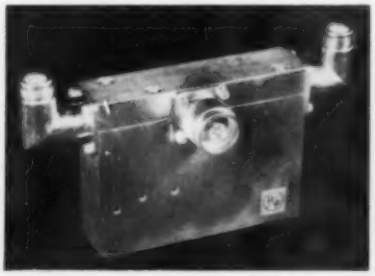
be supplied in a variety of insulating materials. DeJur-Amsco Corp., Electronic Sales Div., 45-01 Northern Blvd., Long Island City 1, N. Y.

• **Film resistor for use in potentiometers** provides essentially infinite resolution.

Device has extremely low friction, a temperature coefficient of 0.0005 ppm./C, and comes in resistance values of several hundred ohms to several megohms.

Power rating is 1/5 to 2 watts, depending upon size. Greenleaf Manufacturing Co., 7814 Maplewood Industrial Court, St. Louis 17, Mo.

• **UHF-Tacan** duplexer permits operation of UHF communications equipment and Tacan receiver from a common broadband antenna, instead of requiring separate antennas. Insertion



loss is less than 0.5 db., VSWR is less than 1.5:1, and isolation between channels is 60 db. or more. Unit can withstand 2,000 watts peak. Microphase Corp., P.O. Box 11668, Greenwich, Conn.

Instrumentation

Multi-purpose pressure transducer contains both an absolute and a differential pressure type sensor, each with dual precision-pot output signal sources. Unit reportedly has high linearity, reso-

lution and repeatability and low hysteresis. Fairchild Controls Corp., Components Div., 225 Park Ave., Hicksville, N. Y., or 6111 E. Washington Blvd., Los Angeles 22, Calif.

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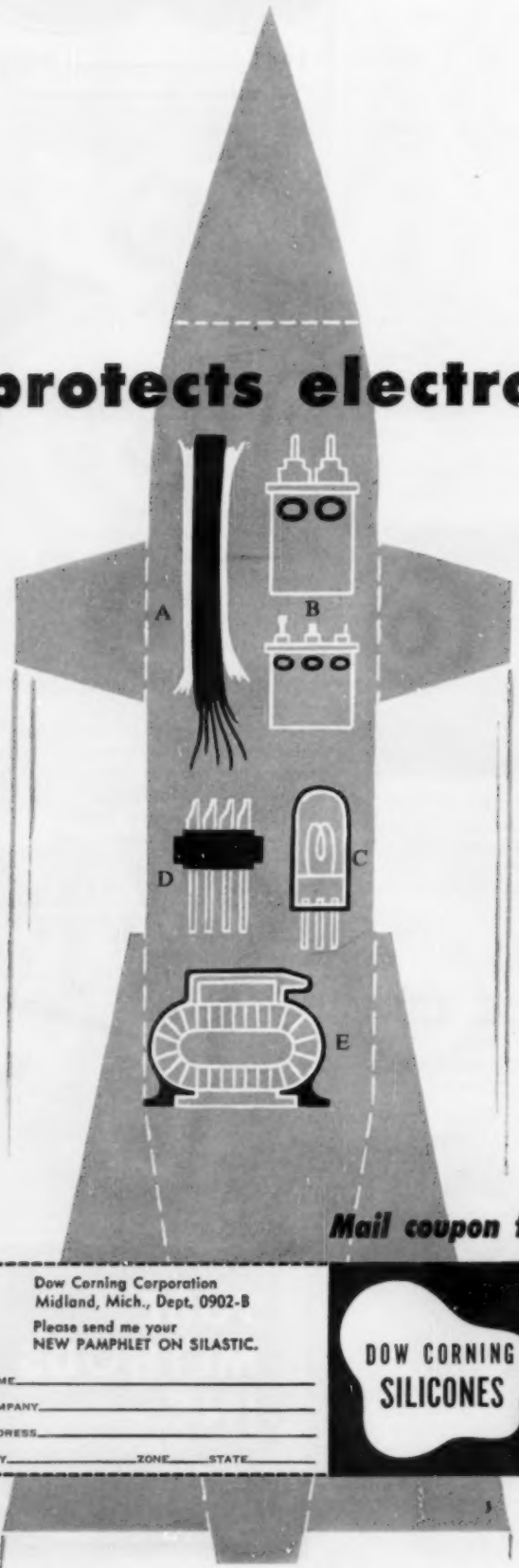

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FOAM-PLASTIC fairing for trailing edge of propeller blade weighs and costs only half as much as equivalent metal fairing, according to developer, Curtiss-Wright.

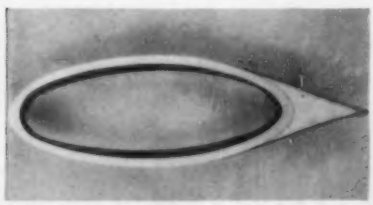
Plastic Fairing Ups Prop Performance

A new foam-plastic propeller blade shank fairing which costs and weighs half of an equivalent sheet metal fairing has been developed by Curtiss-Wright Corp.'s Propeller division.

Flight tests indicate that the plastic trailing edge fairings boost Super Constellation cruising speeds by 5 mph. and give a better rate of climb.

Fairings are made of a polyurethane foam plastic weighing about 20 lb./cu. ft. They can be installed in the field and do not require that props be returned to the factory.

The plastic can be tapered smoothly into the blade, giving a clean aerodynamic shape. It can be molded into compound curves and it is self-bonding to the metal surface of a propeller shank.



SHANK CROSS-SECTION shows close bonding of foamed plastic to metal. Rings normally used to anchor sheet metal cuffs on shank are not needed with plastic fairing.

KLM Royal Dutch Airlines has accumulated 1,700 hours of flying time on the fairing installation on its entire fleet of Super Constellations. Other installations under way or contemplated are by Seaboard & Western Airlines on L-1049 Connies and Trans-Canada Air Lines an Super Connies. Air France's 1649 Super Constellations are expected to be equipped with plastic faired props.

The Air Force has ordered full plastic fairings for all C-124C Globemasters and is contemplating a retrofit program for all C-124A aircraft, according to the manufacturer. A prototype plastic fairing is being made for the turboprop-powered Douglas C-133 cargo plane.

New Crash Fire Prevention System Passes First Tests

Crash fire prevention system developed for NACA and the Air Force by Walter Kidde & Co., Inc., has operated successfully in its initial test work on C-82 aircraft. Next step will be a 300-hr. flight test program on two C-119Fs.

Kidde is also working with Trans-Canada Air Lines on a prototype fire extinguishing and crash fire prevention system for the carrier's Viscounts. Cost of such a combination system is estimated to be about 50% higher than a fire extinguishing system.

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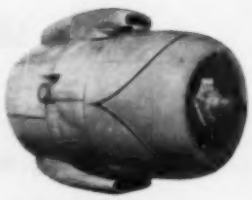

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CAB Report on Northwest DC-3 Accident

Co-Pilot Shut Throttle on Gear-Up Order

At 1819,[1] July 15, 1955, a Northwest Airlines DC-3, N 45333, operated as Flight 610, was substantially damaged when it collided with a powerline pole during an attempted go-around at Yakima Airport, Yakima, Washington. None of the 15 occupants was injured.

The flight originated at Seattle, Washington, destination Spokane, Washington, with a scheduled stop at Yakima. Departure was from Seattle-Tacoma Airport at 1730 on an IFR (Instrument Flight Rules) flight plan via Green Airway 10 at 9,000 feet cruising altitude. The crew consisted of Captain Lavern R. Taylor, First Officer Homer H. Craven, Jr., Stewardess Eleanor Elaine White; there were 12 passengers.

According to company records gross weight of the aircraft at the time of takeoff was 23,347 pounds and the load was properly distributed. The maximum allowable gross weight is 25,200 pounds.

At 1738 the IFR flight plan was cancelled and refiled DVFR (Defense Visual Flight Rules) direct to Yakima. The flight was advised at 1805, in its first contact with the company radio at Yakima, of some storm activity south of Yakima Airport. Three minutes later a second advisory was received reporting hard rain on the airport and wind from the south. Over Tieton, Washington, (about 20 miles north-northwest of Yakima) at 1809 the flight changed to the Yakima Control Tower frequency and received clearance for an approach to runway 22.

When the aircraft was on base leg the tower advised that the wind was south 10 knots. Approach clearance to runway 16 was then requested and received and the aircraft altered its flight path accordingly. One minute out on final approach (1819) the flight was advised of a 13-knot south wind and cleared to land. At this time the storm had passed to the north of the airport and the ceiling and visibility were well above VFR minimums.

The aircraft touched down in the first quarter of the wet runway, rolled nearly 2,000 feet, and started a go-around. From a low altitude it settled to the ground just beyond the end of the runway, rolled a short distance and again became airborne. A very short distance beyond this point the right wing struck a powerline pole tearing off a portion of the wing.

The aircraft continued to fly, just above the ground, across a half-mile-wide pasture and flew through a small willow tree on the south edge of the pasture. It landed a few feet past the tree and rolled several hundred feet to a stop. All passengers left the aircraft promptly by the stair type cabin door and were then guided to a safe distance by the stewardess.

The change from the approach to runway 22 to runway 16 was made while the flight was far enough north of the airport to permit proper runway alignment. A number of persons observed the approach and touchdown. The majority of these stated the approach appeared to be at a normal altitude but posibly faster than usual.

All agreed that there was a considerable amount of water on the hard surfaced blacktop runway at the time of the landing. Runway 16 which was 4,090 feet long, was in good condition, and relatively smooth.

'Hydroplaning' Effect

The captain, who had flown the aircraft from Seattle, stated the touchdown was at an indicated airspeed of 70 knots on the

[1]All times referred to are Pacific Standard and are based on the 24-hour clock.

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wet runway approximately 1,000 feet from the approach end and that brakes were applied repeatedly with no braking effect. He said there was a "hydroplaning" effect caused, in his opinion, by the water on the runway. Hydraulic pressure was normal and brake pedal pressure felt satisfactory.

Immediately after touchdown flaps were retracted and during the first portion of the landing roll the tower cleared the aircraft to the ramp. After he advised the first officer of no braking effect Captain Taylor advanced the throttles to takeoff power and a go-around was started with the aircraft becoming airborne at 70 knots indicated air speed. Further, that as the aircraft passed the south end of the runway at an altitude of appoximately 25 feet and an indicated airspeed of 78 knots he ordered "gear up."

Instead of raising the gear the first officer pulled both throttles back to the closed positions. The captain testified that he then lowered the nose to hold air speed and reapplied full throttle. He stated that he did not land immediately after striking the powerline pole because of numerous cattle in the pasture.

It was determined that the aircraft touched down on its main gear 1,040 feet from the approach end of the runway and that a go-around was started when about three-quarters of the runway length was used.

Tire marks disclosed that the aircraft settled to the ground 110 feet beyond the runway end and rolled 219 feet before again becoming airborne. Fifty-nine feet beyond this point the right wing struck a powerline pole 15 feet above the ground. The next contact was with a 10-foot-high willow tree approximately one-half mile farther south. The wheels again contacted the ground 55 feet past this tree and the aircraft came to a braked stop after rolling 575 feet.

The right outer wing and aileron were substantially damaged. There was a two-foot hole in the left side of the fuselage aft of the wing fillet. The line of wing severance extended from the leading edge, at a point 14 feet from the tip, rearward and inboard to the inboard end of the aileron. Both of the engines and the brake system were found to function in a normal manner. This condition is confirmed by testimony of the captain.

Previous Go-Arounds

Captain Taylor testified that during most of his 12 years as a pilot for Northwest Airlines he had flown over this particular route.

He also stated that he had landed at Yakima Airport on runway 16 numerous times and had executed several go-arounds from this runway; also, that the approach to runway 16 was over high trees and powerlines and necessitated a slightly higher than normal approach. He further testified that although the 70-knot airspeed was lower than desired for the start of a go-around there was no difficulty, and he expected none, until the throttles were closed at 78 knots airspeed when he ordered "gear up."

First Officer Craven testified that he was not advised of the go-around and that the order for gear up was the only thing said by the captain after power was applied and the go-around started.

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the throttles back his testimony was: "At the time the command was given I was expecting an order to reduce power and inasmuch as it looked like a crash was inevitable—when the order came, I moved them by spontaneous action."

The first officer's left hand was resting on the control pedestal but not touching the throttles as the go-around started. He further testified that he estimated the aircraft's altitude ten feet or more above the ground when near the end of the runway and at that time he was waiting for the captain's order to reduce power and cut switches.

Since his recall to Northwest Airlines First Officer Craven had flown three roundtrips over the Seattle-Yakima-Spokane route with Captain Taylor. He had been furloughed in December 1953 and recalled on July 15, 1954.

Mr. Craven first qualified on DC-3 equipment with Northwest Airlines in March 1952 at Minneapolis, Minnesota, and had acquired 1,200 hours on DC-3s since that time.

Weather Effect

U. S. Weather Bureau records indicate that cumulus cloud formations began to be reported about noon, on July 15, 1955, over the Cascade Mountain range in western Washington. By late afternoon and early evening a few isolated thunderstorms were reported. These were individual storms of relatively small diameter moving rather rapidly.

The surface winds accompanying the thunderstorms were variable in direction and gusty. However, due to the localized character of the storms, the winds were of short duration. The storm that passed over the Yakima Airport shortly before Flight 610 landed, traveled from the southwest to the northeast and was over the field for not more than ten minutes.

The U. S. Weather Bureau at Yakima reported maximum gusts of 40 knots during the storm and no windshift was noted. The airport tetrahedron was pointing south during the entire approach and landing. This tetrahedron, although held electrically and remotely controlled, is designed to override this control and swing freely with any wind shift of 15 miles per hour or more. The U. S. Weather Bureau at Yakima Airport recorded .08 inch precipitation during the storm.

ANALYSIS

A local thunderstorm was over the airport a short time before Flight 610 touched down.

This storm placed .08 inch of rain on the runway in a very short time but the storm had passed the airport at the time of the landing. The runways were quite wet which resulted in poor braking.

Touchdown on the first quarter of a wet runway with no resulting braking action created a definite possibility of overrun; therefore, the captain's decision to go around appears to be proper. He had made previous go-arounds on runway 16 during his twelve years of piloting for Northwest Airlines and there is no reason to doubt that this one would not have been successful had it not been for the unexpected power inter-

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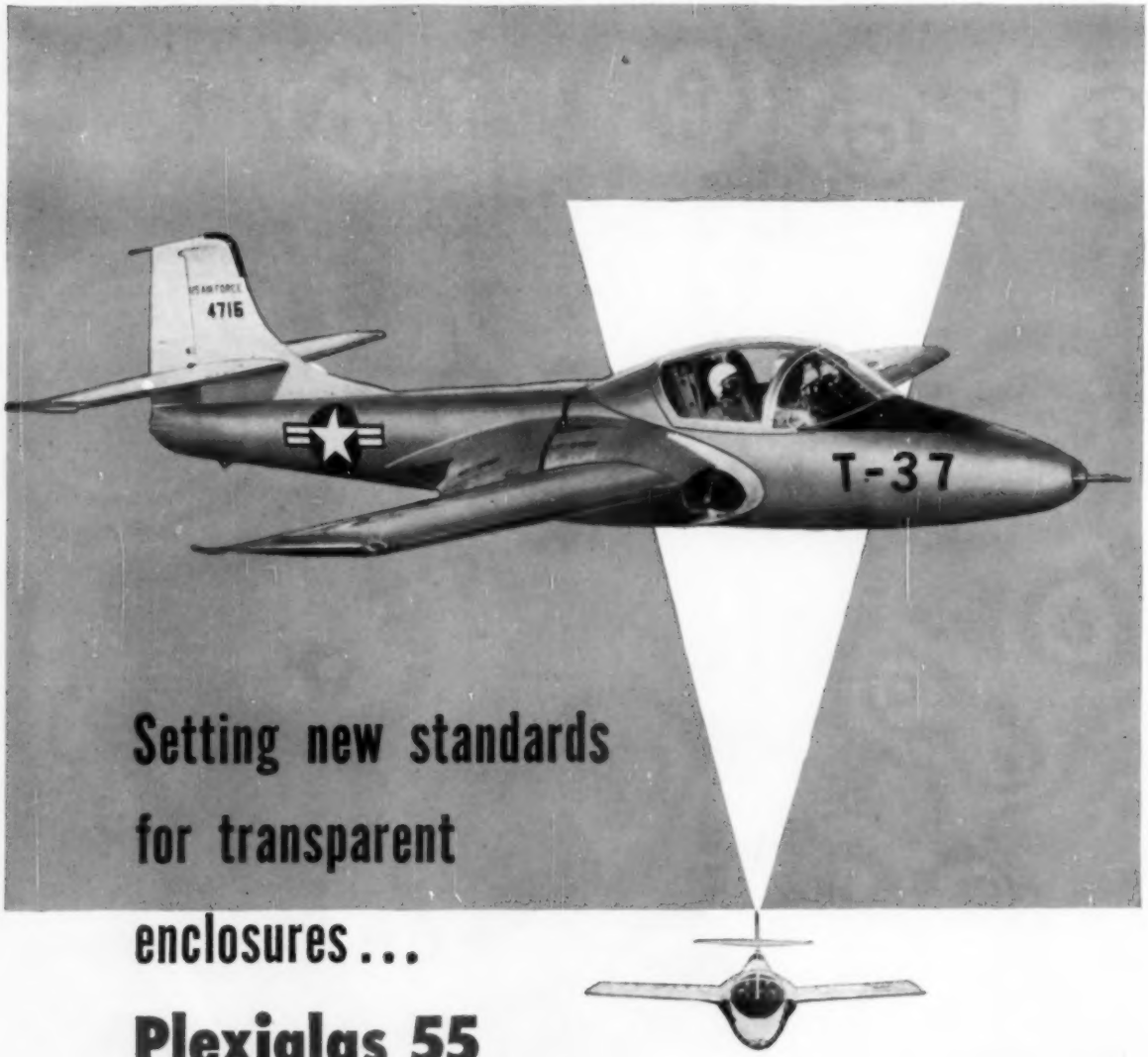

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ruption caused by the first officer's action of closing both throttles instead of retracting the landing gear as ordered by the captain.

FINDINGS

On the basis of all available evidence the Board finds that:

1. The carrier, the aircraft, and the crew were currently certificated.
2. The gross weight of the aircraft was under the maximum allowable and the load was properly distributed.
3. The runway surface was wet from recent rain which prevented normal braking action.
4. The captain properly initiated a go-around to avoid a possible overrun.
5. After becoming airborne the first officer heard correctly the captain's order "gear up."
6. Instead of retracting the gear as ordered by the captain the first officer closed the throttles.
7. The power interruption caused the aircraft to momentarily settle to the ground.
8. After power was re-applied the aircraft struck a powerline pole.
9. There was no failure or malfunctioning of the aircraft or its components prior to striking the pole.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the co-pilot's action in closing the throttles which subsequently resulted in the aircraft striking a powerline pole.

By the Civil Aeronautics Board:

Ross Rizley
Joseph P. Adams
Josh Lee
Chan Gurney
Harmar D. Denny

SUPPLEMENTAL DATA

The Civil Aeronautics Board was notified of the accident by Northwest Airlines Dispatch Office, Seattle, Washington, at 1900, July 15, 1955. An investigation was immediately initiated in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. A special investigation was ordered by the Board and depositions were taken at Seattle, Washington, on August 2, 1955, and at Yakima, Washington, on August 4, 1955.

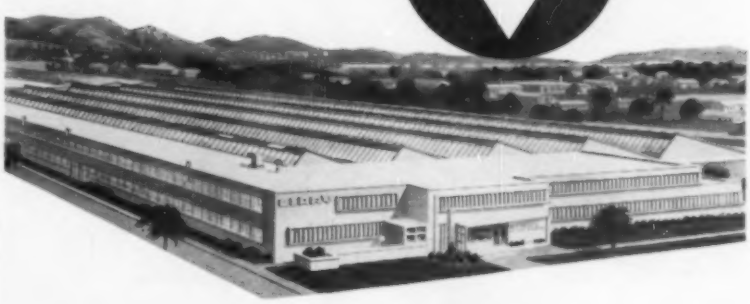
Air Carrier

Northwest Airlines, Inc., is incorporated in the State of Minnesota and maintains its principal place of business at Minneapolis, Minnesota. The company possesses a certificate of public convenience and necessity issued by the Civil Aeronautics Board and an air carrier operating certificate issued by the Civil Aeronautics Administration which authorizes the carriage of persons, property, and mail over the route described in this report.

Flight Personnel

Captain Lavern R. Taylor, age 45, was employed by Northwest Airlines as a pilot in 1943. He holds a valid airman certificate with an air transport rating and type rating for DC-3 aircraft. Captain Taylor has, according to company records, a total of 7,188

Here at Clary



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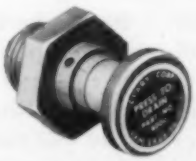
Here under one roof at Clary is every facility to solve your fuel, hydraulic, and pneumatic valve problems. Here are excellent design-engineering, manufacturing and laboratory facilities . . . able to produce small valves or large valves . . . existing valves or brand-new ones . . . valves of every description for airframe and missile applications . . . from the small precision Avron valves shown below to complex propellant valves.

So when you think of valves, we hope you'll think of Clary. We'd like very much to be of service to you.



AVRON High Pressure Bleeder Valve, 3,000 psi. Self-sealing, spring and pressure-loaded closed. Bleeds water, air, etc. from pneumatic and hydraulic systems under pressure.

AVRON Air and Fluid Pressure Regulators. Temperature range in qualification tests, −65°F. to +250°F. Relief functions are independent of regulation. Pressurization between 0 and 100 psi, for such uses as reservoirs, compartments, anti-icing, radar wave guide channels, pneumatic and fluid control systems.

AVRON Aircraft Drain Valves. Self-locking and self-sealing. All standard styles and sizes of inlet and outlet fittings are provided for tube, pipe and hose, sizes ¼", ⅜" and ½". For use with all types of aviation fuels, including JP-4, plus other fluids such as alcohol, water, hydraulic fluid, ethylene glycol.

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CLARY CORPORATION, San Gabriel, Los Angeles County, California

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This Johns-Manville Goetze gasket must withstand a tremendous bending moment caused by the flexure of the Boeing B-52's wings. Combining a core of fine steel mesh with an aluminum sheath provides strength to resist this force and resiliency to keep a tight seal. Boeing selected this Goetze gasket only after exhaustive performance tests.

Johns-Manville Goetze Gaskets

maintain a tight seal in pneumatic duct system

THIS critical sealing problem was solved for Boeing with a special gasket, designed and engineered by J-M Goetze Gasket technicians.

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For more than 60 years, Goetze has pioneered the development of metal gaskets. Today, thousands of precision-made styles and sizes are available. Goetze Gasket experts will be glad to help you select the one that best meets your needs. Or they will custom-design something new, tailor-made to your specific requirements.

Write today for further information on Johns-Manville Goetze Gaskets and other J-M products for aviation. Ask for Brochure AV-1A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit, Ontario.

THERE'S A J-M GASKET FOR EVERY SEALING PROBLEM

Spirotallic | Corrugated Metal | Screen | French Type | Single Bead | Mesh Filled | Non-Metallic

Johns-Manville PRODUCTS FOR THE AVIATION INDUSTRY

pilot hours, of which 2,824 were required in DC-3 equipment. His last first class physical examination was passed on June 8, 1955.

First Officer Homer H. Craven Jr., age 30, was employed by Northwest Airlines as a pilot in 1951. He holds a valid airman certificate with commercial pilot, single- and multi-engine land, instrument, and flight instructor ratings. Mr. Craven has, according to company records, a total of 3,400 pilot hours, of which 1,200 were acquired in DC-3 equipment. His last first class physical examination was passed on September 10, 1954.

Stewardess Eleanor Elaine White was employed by Northwest Airlines on December 3, 1954. Her DC-3 check rides on January 26, 1955, and March 19, 1955, were graded as satisfactory.

The Aircraft

N 45333, a Douglas DC-3, serial number 6330, was owned by Northwest Airlines, Inc., and was manufactured on December 3, 1942. It had 27,539 flight hours when the accident occurred.

The aircraft was equipped with Pratt and Whitney R-1830-92 engines and Hamilton Standard model 23E50-473 propellers. Time on both engines and both propellers since overhaul was 795 hours and 595 hours, respectively.

Signal Tells Pilot When to Feather

Safeather is an automatic power failure indicator which operates on the torque principle to flash a red signal indicating the correct propeller to feather.

The equipment's torque sensing unit is attached to the airplane's engine mounts.

The manufacturer points out that when an engine is delivering power, the mount is subjected to a twisting force; upon cessation of power, this force is released. Safeather notes this release of torque and actuates the cockpit signal.

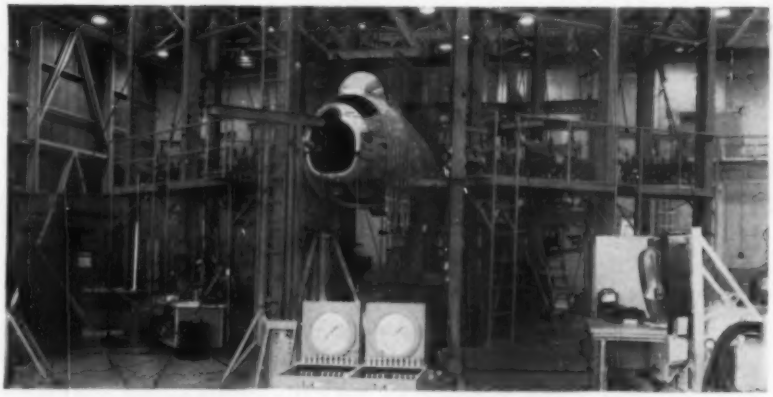
Weight for a twin-engine installation is less than 4 lb. and installation takes less than one day. The manufacturer is submitting individual kits for applicable types of aircraft to Civil Aeronautics Administration for approval.

The maker is Allied Instrument Manufacturing Corp., 8240 Travelair, Houston 17, Tex., an instrument maintenance and subcontracting firm.

Spanish Airline Orders Five Convair 440s

Iberia, the Spanish airline, has ordered five Convair 440 Metropolitans for use on its continental routes out of Madrid. The order, scheduled for delivery about a year from now, brings the total number of Metropolitans ordered to 74. The first Metropolitan off the production line was delivered last week.

NORTH AMERICAN'S Columbus Division



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With the highly-successful NAVY FJ-4 FURY JET* in production, and with other, years-ahead designs being developed, North American's Columbus Division has become a self-sufficient, proficient organization within North American Aviation, the company that has built more airplanes than any other in the world.

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Engineering Ahead for a Better Tomorrow

NORTH AMERICAN AVIATION, INC.

*Reg. U.S. Pat. Off. COLUMBUS DIVISION

The Year Advertising Helped

IN 1954 we had a business recession in the United States. Sales fell about 4% during the year. If management had followed the historic pattern of business ups and downs, advertising volume would have fallen much further.

But in 1954 the volume of advertising did not fall. It increased over 5%. Every effort was made to stimulate sales when sales were needed to sustain prosperity.

This was something entirely new under the sun. It had a powerful influence in making the recession of 1953-54 one of the mildest on record. It helped greatly to speed business on to the record-breaking levels it has attained today.

There are several reasons why America's business management attacked this decline in sales with more advertising. One of them grew out of the greatly strengthened position of the American consuming market. Consumers' income after taxes has been rising an average of over $10 billion a year since 1946, and this rising income is more widely distributed than ever before. Furthermore, consumers have piled up reserves of about $215 billion in cash or its equivalent. These reserves offer a new and powerful inducement to increased selling and advertising effort even in the face of a possible decline in consumer income.

Taking the Longer View

However, the principal reason why a sales decline was attacked with increased advertising is management's new-found conviction that good advertising is essentially an investment in the development of a market. Successful development requires sustained investment. The inclination of business management to take this longer view, is, of course, motivated by the fact that the American market, with over 3 million consumers being added annually, is growing at a prodigious rate.

Ten years ago only a handful of companies had plans for investment in new producing facilities extending beyond the current year. Today almost all leading companies have investment programs running some years ahead. And keeping pace with these long-range business investment plans has been the development of sales and advertising programs to

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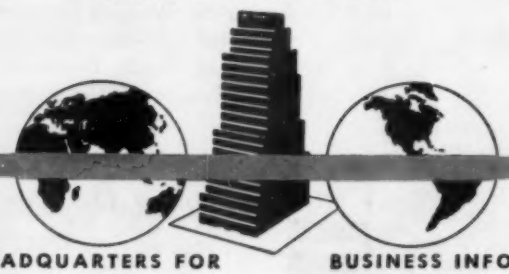

HEADQUARTERS FOR BUSINESS INFORMATION

Kill a Business Recession

reach tomorrow's greatly expanded markets.

This crucial role of advertising in providing driving power for our economy is gaining greater recognition every day. In his recent book, "People of Plenty," Professor David M. Potter of Yale University remarked: "Advertising is not badly needed in an economy of scarcity, because total demand is usually equal to or in excess of total supply, and every producer can normally sell as much as he produces. It is when potential supply outstrips demand—that is, when abundance prevails—that advertising begins to fulfill a really essential economic function."

Advertising's Key Role

Today abundance so completely prevails in the United States that it has been conservatively estimated that as much as a third of everything offered for sale falls in the realm of "optional consumption." That is, consumers can "take it or leave it" without any immediate personal inconvenience. But if they decide to "leave it," a terrific economic depression will not be far behind. In such circumstances, advertising—in which, in all of its forms, we are now investing about $9.2 billion annually—clearly is of crucial importance to our continued prosperity.

In performing its key role in past years, American advertising never realized its full potential. It successfully promoted sales. But it never was called upon to promote an overall economic stability as a direct outgrowth of increased sales.

By successfully promoting both sales and economic stability, as it did in 1954, advertising surely has added new strength to the American economy. It has also added a great new and constructive dimension to advertising itself. This accomplishment makes the celebration of our first National Advertising Week (February 19-25) a particularly notable occasion.

One of the surest means of expanding your sales volume in today's $150 billion *industrial* market is through dominant advertising in the publications directly serving your major customers and prospects.

McGraw-Hill's business and technical publications can give you quick access to the men who initiate, specify and approve the purchases of industrial products and services. Because all are leaders in their respective fields, you are assured a maximum return on your investment when you specify a McGraw-Hill publication to carry your advertising to your most important markets.

Allegheny Pleased With Martin 2-0-2s

Low cost, successful operation, public acceptance convince carrier plane now is ready for heavy duty.

By Craig Lewis

Washington—Allegheny Airlines, the third local service carrier to use the Martin 2-0-2, is rounding out its first year of operation with a mixed fleet and preparing to expand its Martin operations.

After some difficulties and disappointments during the first months of Martin service, Allegheny thinks the education cycle is ended and that the 2-0-2 is ready for heavy duty in the coming peak summer season, President Leslie O. Barnes told AVIATION WEEK Allegheny is even happier with the Martins now than it was when the initial purchase was made.

Allegheny bought its first four Martins last spring and has operated them on some of its lighter routes to gain experience and develop reliability. Last month, two more Martins were added to the fleet which includes 14 DC-3s.

Passenger Load Grows

One of the original Martins was lost when an engine caught fire on a training flight. Damage was so extensive the airline decided to replace the plane rather than repair it. Thus Allegheny winds up with a total of five 2-0-2s for a little over $1 million. Barnes says the Martin purchase provided a cheap, modern plane to supply a pressing need for more airlift.

The local airline is encouraged by public acceptance of the new transport and is optimistic about the summer season when it gets into full swing. Passenger loads on the 2-0-2 have shown a growth which runs counter to the usual winter decline in traffic (see box on next page). In January, the average load on the Martins was 16.4 while the DC-3 average was 9.6, compared with a DC-3 average load of 9.8 in January of 1954.

The improvement in Martin loads is more encouraging because of the extremely bad weather conditions in January. Operating percentage for the month was 85%, compared with 96% for the previous January. Allegheny expects the Martins to be operating free of subsidy when load factors pass the 50% mark and the first year of experience begins to pay off in operating economy.

The capacity of the five Martins represents nearly a total gain in airlift, since the airline didn't reduce its original fleet when the 2-0-2s were acquired. One DC-3 traded in the deal was a non-standard airplane Allegheny was trying to dispose of before the new transports were bought.

Barnes says that his airline has no current plans to buy more 2-0-2s, but that when more capacity is needed to handle traffic growth, it will be provided for through the purchase of Martins—or similar aircraft if no Martins are available. There are no plans to add to the DC-3 fleet.

Mixed Fleet Certain

Allegheny doesn't ever expect to have an all-Martin operation. Some points on the carrier's system have neither the airport facilities nor the traffic to support anything but a DC-3 operation. Until an efficient replacement for the DC-3 is available, Allegheny will use a mixed fleet, and Barnes predicts that there is little future prospect of a single-airplane fleet for local airlines because of their characteristics.

The Martin was bought by Allegheny as a transitional aircraft to provide for business growth while a replacement for the DC-3 is developed. The airline feels that the addition of the 2-0-2 will allow it more time to look at the DC-3 replacements and wait for them to prove themselves.

Barnes points out that both the Fokker F-27 and the Handley-Page Herald, the two potential replacements that have prototypes flying, are at least two years from actual operation. Both look attractive, he says, but they are both economically unproven. According to estimates, seat-mile costs of the Martin 2-0-2 are better than either the F-27 or the Herald right now, Barnes said.

A DC-3 replacement will have to point to a subsidy-free operation, Barnes feels. He agrees with the general industry opinion that the local airlines will never get off subsidy while they are forced to use the DC-3.

CAB Support Needed

In order to get off subsidy, the local airlines are going to have to spend substantial amounts of money, and they will need the support of Civil Aeronautics Board policy to do it, according to Barnes. He feels the CAB will have to shift its policy on underwriting local airline activities before the carriers will be able to make any serious move to acquire a replacement for the DC-3. Prices currently quoted on replacements are around $500,000.

The CAB has previously refused to spend any extra money to help a feeder line move on to more modern equipment. When Pioneer Airlines re-equipped with the Martin 2-0-2, the Board turned down a request for extra subsidy to underwrite the move. Pioneer shifted back to the smaller DC-3 and eventually merged with Continental Air Lines.

Southwest Airways has had more luck with the switch to Martins, although the CAB said it wouldn't pay more than DC-3 costs to carry traffic on the Martins. Like Southwest's Martins and Mohawk Airlines' Convair 240s, Allegheny's new transports are strictly a management risk and the Board hasn't said it will provide any financial help.

AFTER INITIAL difficulties, Allegheny is ready to place its 2-0-2s on heavy-duty runs.

Allegheny Airlines

Average Passengers Loads

	1954 DC-3	1955 DC-3	1955 Martin	1955 Combined
July	11.3	12.6	15.2	13.1
August	11.7	12.1	14.2	12.5
September .	11.0	12.6	16.5	13.3
October ..	11.3	11.9	14.9	12.4
November .	10.0	10.4	11.5	10.5
December .	9.1	9.8	16.0	10.5

Barnes doesn't think the local airlines will get off subsidy until three major changes occur, including replacement of the DC-3 and relief from special restrictions applied to the local carriers by the CAB. The third necessary change, according to Barnes, is the recognition that the transition from the DC-3 "will be slow, tortuous and dangerous" unless it is backed with CAB policy.

Mail Pay Declines

Allegheny's mail pay has declined each year since 1952 as business has increased, and it is expected to continue to decline. The carrier's system is expected to expand 15% in plane-miles flown each year for the next three to five years. While 1956 plane-miles are increasing 15%, Allegheny expects revenues to climb at least 25%.

Last year, traffic showed a 31% gain to 349,860 passengers and 55,918,000 passenger-miles. Express ton-miles increased 46% in 1955.

Senate Unanimously Passes Sabotage Law

Washington—Legislation authorizing the death penalty or life imprisonment for sabotage of commercial aircraft resulting in a death was passed unanimously by the Senate.

Introduced by Sen. Warren Magnuson (D.-Wash.), chairman of the Commerce Committee, the measure also provides a penalty of $10,000, or 20 years imprisonment or both, for (1) aircraft sabotage which does not result in a death, and for (2) false information, intentionally imparted, concerning an attempt being made at commercial aircraft sabotage.

The crash of a United Air Lines plane near Denver last Fall as a result of a bomb placed in a passenger's baggage, which caused 44 deaths, focused attention on the need for the legislation.

Sen. Earle Clements (D.-Ky.) pointed out that statutes now in effect either do not adequately cover aircraft sabotage or do not provide penalties commensurate with the crime.

Curtis Takes White House Post To Tackle Nation's Air Problems

By Preble Staver

Washington—Edward P. Curtis takes office next week as Special Assistant to the President for Aviation Facilities Planning, a position which was recommended by the Budget Bureau's Aviation Facilities Study Group headed by William Barclay Harding (AW Jan. 16, p. 26).

Curtis has been spending the time since his appointment on Feb. 11 in consultation with Harding and other members of Harding's study group. He has also visited with the Secretaries of Commerce and Defense, each of whom is to designate a top-level department official to work for Curtis in a liaison capacity.

Initially, Curtis is expected to work with a small personal staff. He may later ask for the assistance of an advisory board, which was suggested in the Harding report.

The President's action in appointing Curtis represents full endorsement and direct implementation of the Harding group's recommendations.

The group had stressed the need for "full time high-level leadership to direct a continuing long-range study to accompany an integrated aviation facilities development program, prompted by dangerously increased air traffic congestion."

Edward P. Curtis, newly appointed Special Assistant for Aviation Facilities Planning, a post created by President Eisenhower. The 59-year-old Eastman Kodak executive is a long-time friend of the President. He served as a major general and chief of staff of the Strategic Air Force-Europe during World War II under the command of Gen. Carl "Tooey" Spaatz. He holds a private flyer's license and was a combat pilot in the first World War. Still active in the Air Force Reserve, Curtis is a director of the Air Force Association.

President's Concern

The responsibilities delegated to Curtis include:

- **Direction and coordination** of a long-range study of the nation's requirements for aviation facilities.
- **Development of a comprehensive plan** for meeting in the most effective and economical manner the needs disclosed by the study.
- **Formulation of legislative,** organizational, administrative and budgetary recommendations to implement the plan.

In naming Curtis, the President emphasized that the "revolutionary possibilities and the all-embracing character of aviation development require an independent, over-all study of this national problem." He indicated his concern over the growing civil and military traffic and attendant problems in his letter to Curtis.

"I am taking this action," he said, "because the rapid technical advances in aviation and the remarkable growth in the use of air transportation have confronted the nation with serious aviation facilities problems.

"Modern aircraft can be operated in the numbers required by the national defense and the civilian economy only if airports, navigation aids, air traffic control devices and communications systems are suitable for their needs.

"Moreover, anticipated further increases in air traffic, the introduction of jet propulsion for civil as well as military aircraft, the advances being made in vertical flight, and the greater use of higher altitudes, all presage much heavier future demands upon our facilities for navigation and traffic control," the President said.

Top Level Cooperation

A comprehensive aviation plan should provide the basis for these accomplishments:

- **Timely installation** of technically adequate aids.
- **Optimum coordination** of efforts of the civil and military agencies.
- **Avoidance of costly duplications** of systems and equipment.
- **Effective participation** by state and local authorities and aircraft operators in meeting facilities requirements.

"To delay the formulation of the plan is to invite further congestion of

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a new concept of executive transportation

Now, go by air as never before...faster, safer, more comfortably, *door-to-door*...in the BELLAIRUS, the helicopter designed exclusively for executive and utility operation.

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The Model 47H BELLAIRUS fills the need for a new dimension of executive transportation—*as the crow flies*... from office to plant, plant to plant, office or plant to airport. It is spacious, custom decorated, accommodates a pilot and two passengers, and has ample head and leg room, soundproof cabin and large baggage compartment.

The BELLAIRUS is an improved version of the basic Bell helicopter which has accumulated two million flight hours and an unparalleled world-wide record for safety and economy. It can go anywhere, land anywhere.

We invite your inquiries as to why the BELLAIRUS can be one of your most valuable business assets, how it can save those precious hours for your executives.

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Amphibious...Deluxe cabin interior...High cruise and top speeds

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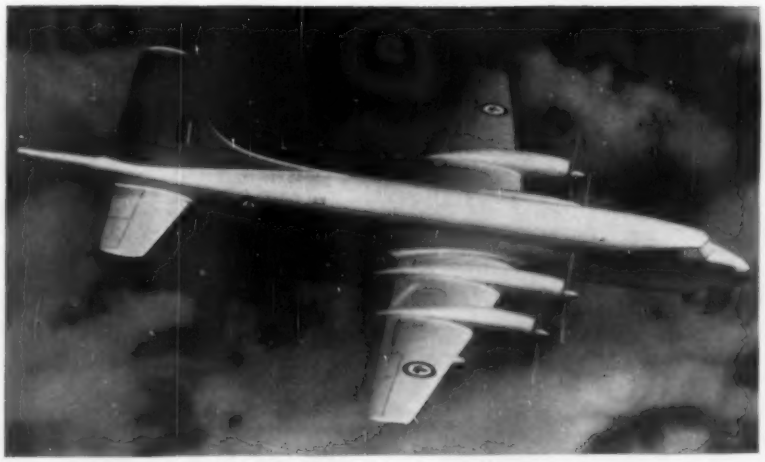


Canadair's Maritime Britannia

Proposed piston-powered version of Bristol Britannia turboprop transport being developed by Canadair Ltd. as a military reconnaissance aircraft is shown in above sketch. Aside from the piston engines, which will replace the conventional Britannia's turboprop to provide longer range at low altitudes, changes shown in sketch include a large radar dome under the nose and a stinger tail to house Magnetic Aerial Detection gear.

the airspace, needless hazard, economic loss, inconvenience to users and possible impairment of the national security," President Eisenhower said.

Curtis has been assured by the President that he will have the cooperation of both the Department of Commerce and Department of Defense—both concerned with air travel. These two and all other agencies concerned with aviation are to be Curtis' principal resources as he carries out his assignments.

The President told Curtis "there already exists with the Government.... a wealth of experience, much of which should be helpful to you." Curtis was authorized to call upon any official of the Executive Branch for assistance. Furthermore, President Eisenhower said: "I shall expect that from time to time you will give me reports of your progress and that you will promptly advise me of anything that I might do to expedite your work."

FHA, VA Reassured On Jet Noise Problem

Washington—Airline and aircraft industry representatives have presented an optimistic picture with regard to future jet transport noise and runway problems, in contrast to pessimistic reports made by military leaders at the recent Jet Age Conference here (AW Feb. 13, p. 31).

The happier version of what will happen when commercial jet transports are introduced came at a joint conference here between airline and industry executives and officials of the Federal Housing Administration and Veterans Administration.

FHA Commissioner Norman P. Mason said the aviation experts indicated that development of civil jet aircraft probably will necessitate no great change in the size or location of present day airports nor in the aircraft noise situation in airport communities.

Mason said the FHA has been apprehensive about the approaching "jet age" because it is being asked to insure mortgage money for houses and apartment projects near airports. Mortgages run up to 30 years' duration, and FHA and VA wanted a long-range forecast.

The industry experts told Mason that "noise suppression progress to date gives every indication that jet transports will have outside noise characteristics comparable to present piston engine craft."

Mason said he was also assured that "the airport of the future is not going to be too much different from today, although for a period there may be an expansion of runways."

As a result of the assurances, Mason said, "FHA will attempt no major jet age revision of its mortgage insurance policies for homes near airports."

FHA and VA are to be kept informed on noise research by the industry, as well as the Civil Aeronautics Administration, which also was represented at the joint meeting. Others represented included Airport Operators Council, Air Transport Assn., Aircraft Industries Assn., and the National Air Transportation Coordinating Committee.

Civil-Military Radar Use Studied by CAA

Washington—Problems of joint civil-military use of air defense radar information for air traffic control purposes are now under active study by the Civil Aeronautics Administration and the Air Force.

A two-and-a-half year evaluation program, sponsored by the Air Navigation Development Board, gets underway this week. It is being conducted by CAA's Technical Development and Evaluation Center at Indianapolis in cooperation with the Continental Air Defense Command at the latter's radar installation at Rockville, Ind.

The evaluation will determine and test possible methods for CAA use of ADC radar for air traffic control without compromising the primary mission of the air defense equipment. A two-part program will study the performance of equipment in meeting the differing requirements of air defense and traffic control and testing the remoting of raw radar information to the traffic control center.

Initially, CAA and the Air Force are running flight evaluation checks of the Rockville ADC radar. This is intended to show radar coverage and communications required for air traffic control. Flight checking will be done at both low and high altitudes. CAA controllers from the Indianapolis Air Route Traffic Control Center will control a portion of the area from the Rockville installation, maintaining contact with the ARTCC by interphone.

The second phase of the study, beginning in June, will be the first use of a 50-mile microwave link for remoting radar information from the Rockville ADC to the Indianapolis ARTCC. The remote control radar tests are expected to extend over a two-year period.

Permanent Routes Asked For Alaska, Hawaii Lines

Legislation directing permanent certification of intra-Alaska, U. S.-Alaska, and intra-Hawaii airline operations was introduced by Sen. Warren Magnuson (D.-Wash.), chairman of the Senate Commerce Committee.

Two measures would have the effect of providing permanent certificates to Pacific Northern Airlines, Alaska Airlines, Hawaiian Airlines, and Trans Pacific Airlines. One bill stipulates permanent certificates for intra-Alaska and intra-Hawaii airlines operating under temporary certificates who make application within 120 days after enactment. The other stipulates permanent certificates for U. S.-Alaska airlines applying within 120 days, provided service has not been "inadequate and inefficient."

SAFE FLIGHT LIFT INSTRUMENTATION STANDARD ON VISCOUNT SERVING LEADING NATIONAL & INTERNATIONAL AIRLINES

SAFE FLIGHT stall warning equipment is prominently important on these turbo-prop planes. SAFE FLIGHT has also engineered a valuable Speed Control instrument system—available for all aircraft—providing the flight crew with continuous wing lift ratio data. A panel-mounted indicator offers the pilot an accurate reading to maintain stable flight...especially significant for turbo-jet aircraft at the high lift coefficients encountered in take-offs, approaches and landings.

SAFE FLIGHT INSTRUMENT CORPORATION
WHITE PLAINS, NEW YORK

"Pioneers in Lift Instrumentation"

Appeals Court Upholds CAB on Surface Mail

Washington—The right of the Civil Aeronautics Board to allow cargo airlines to carry surface mail under exemption authority has been upheld by the Court of Appeals.

In a split decision, the U.S. Court of Appeals for the District of Columbia supported the CAB's decision to let Slick Airways, Flying Tiger Line and Riddle Airlines take part in the Post Office Department's experiment of shipping surface mail by air.

The majority opinion finds that the Board can authorize an airline to carry mail under its exemption powers. In the case of the three all-cargo airlines, which aren't certificated for mail, the Court agrees with the Board that unusual circumstances permit exemption authority for participation in the surface mail experiment.

"These cargo carriers have available space in which surface mail may be carried," the Court said in the majority opinion, written by Judge Walter M. Bastian. "The Postmaster General desires their services on an experimental basis.

"The experiment appears to be limited to a reasonable time.

"Certification proceedings on either a permanent or interim basis could not be completed in time to enable the cargo carriers to participate in the experiment. We think there are 'unusual circumstances' affecting operation, within the ordinary meaning of the term."

In a dissenting opinion, Chief Judge Henry W. Edgerton maintains that the circumstances involved do not warrant exemption authority. "That certification takes time, and that surface-mail experiments may be brief, are circumstances affecting all uncertificated air carriers," he said.

"It seems to me to follow that these are not 'unusual circumstances affecting' the carriers the Board has exempted. Moreover, these are not circumstances affecting the 'operations' of the carriers. For these and other reasons I think the Board exceeded its authority in granting the exemptions," Judge Edgerton said.

Engine, Pilot Cause Currey DC-3 Crash

Washington—The crash of a Currey Air Transport DC-3 was caused by engine failure and failure of the pilot to verify his runway alignment while committed to an emergency landing, according to a Civil Aeronautics Board accident report.

The accident occurred at the Lockheed Air Terminal in Burbank, Calif. last September when the DC-3 developed engine trouble after takeoff in near-minimum visibility. The crippled plane was cleared for an emergency landing, but it failed to align itself with a runway in making its approach.

Approaching in a nose-high attitude, the DC-3 struck a power line, stalled and crashed into the two Air Force C-54s parked on the field. The DC-3 then cartwheeled, skidded along the apron and crashed into a Lockheed service hangar.

The pilot and copilot and an employe of Lockheed Air Service Terminal were killed.

Investigation revealed a serious engine malfunction which occurred after takeoff.

The probable cause of the accident according to the CAB report, was the pilot's irrevocable commitment to a landing without radio or visual confirmation of his runway alignment following engine failure immediately after takeoff.

Slick Airways Cancels Lockheed 1049H Order

A Slick Airways order for three Lockheed 1049H Super Constellation air freighters has been cancelled, Lockheed Aircraft Corp. announced last week. Slick recently bought three Douglas DC-6A cargo planes from Air Work Ltd. following the British all-cargo line's retirement from the Atlantic run.

The DC-6As, which were immediately available, satisfied Slick's "urgent needs for increased capacity." The Lockheeds were scheduled for 1957 delivery.

Braniff Begins Flights Over New Eastern Route

Braniff International Airways last week inaugurated service over its newly awarded route to the Northeast (AW Nov. 28, p. 12). Initially, the Dallas-based carrier is offering three daily round-trip DC-6 schedules between Newark Airport and Dallas. Two of the schedules are first class, and one flight each way is non-stop between Newark and Dallas. The third schedule is a night coach.

CAB Orders

(Feb. 2-Feb. 8)

GRANTED:

Leave to intervene to the State of Ohio in the case involving transfer of TWA's Cincinnati-Detroit route.

Western Air Lines further time to decide whether to rescind its earlier request to withdraw its exceptions in the United-Western acquisition case.

Northern Consolidated Airlines an exemption to serve Dillingham, Alaska, on its route between Anchorage and Bethel, with certain limitations. The authority is for one year or until decision in the Intra-Alaska route investigation, whichever occurs first.

Mohawk Airlines authority to omit service at White Plains, N. Y., on all flights over segment two of Route 94 in excess of one daily round-trip flight Monday through Friday, and to omit White Plains on all flights over the route on Saturday and Sunday.

Flying Tiger Line an exemption to perform seven charter flights to New York from London, Paris, Brussels, Rome, Athens, Linz, Austria and Bremen, Hamburg or Munich, pursuant to a contract with the Intergovernmental Committee for European Migration.

Riddle Airlines an exemption to purchase a DC-4E aircraft from Aero Maintenance, Inc.

Seaboard and Western Airlines an exemption to provide free transportation to technical representatives of the Lockheed Aircraft Corp. and the Curtiss-Wright Corp. for in-flight observation, for six months.

Leave to intervene in the Syracuse-New York City case to the Chamber of Commerce of the Borough of Queens, New York City.

APPROVED:

Pacific Northern Airlines' agreement with Western Alaska Airlines to provide service on Pacific Northern's route in the Bristol Bay area until a decision is reached in the investigation of the Intra-Alaska air services.

Interlocking relationships between Roger Lewis, Pan American World Airways and Pan American-Grace Airways.

ORDERED:

Japan Air Lines' authority to perform a charter flight between San Francisco and Sao Paulo, Brazil, extended to Mar. 31, 1956.

DISMISSED:

Suspension and investigation of a fare between El Paso, Texas, and Tampa, Fla., filed by Peninsular Air Transport, since the fare has been cancelled.

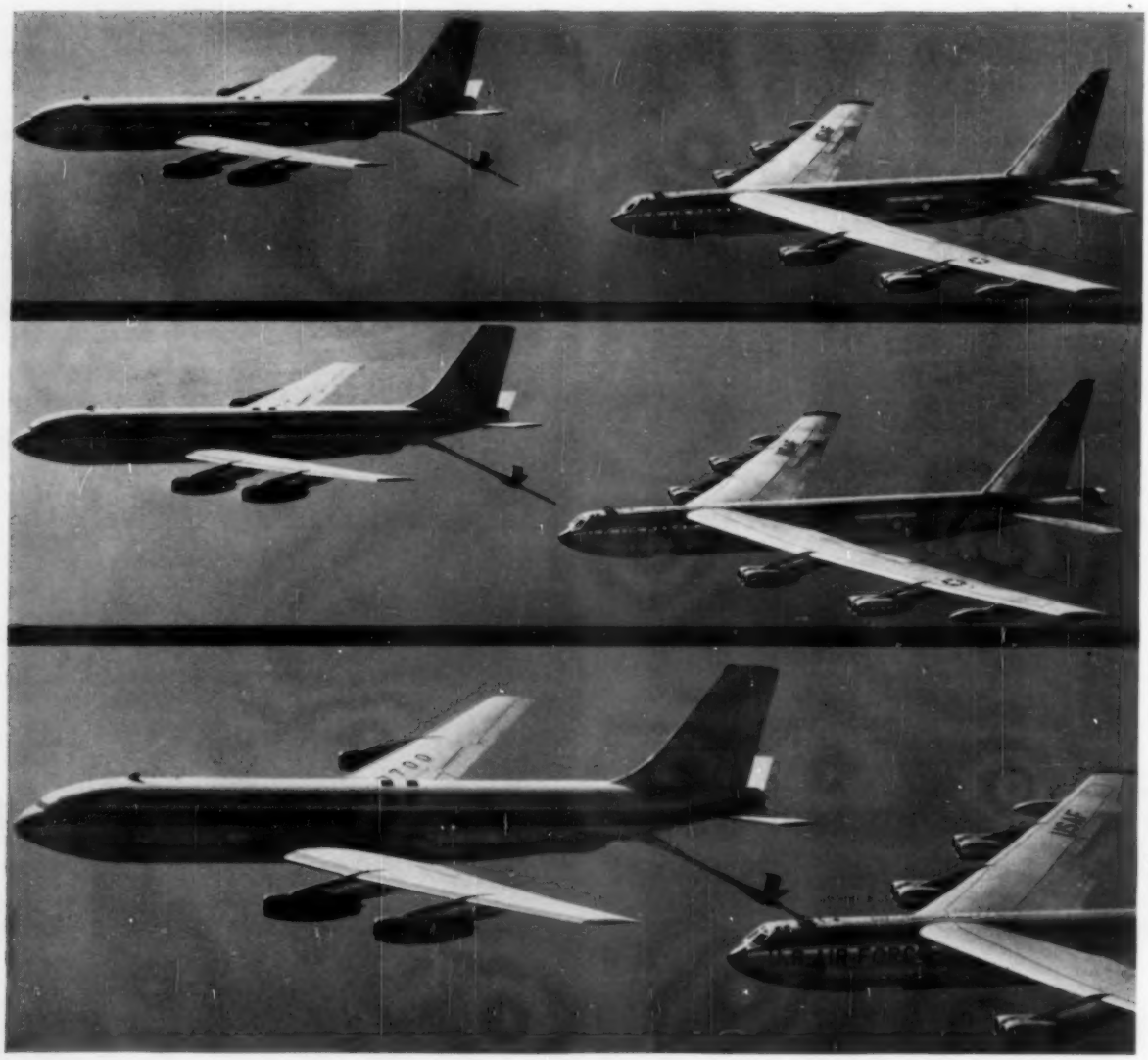
Suspension and investigation of fares between Burbank, Calif., and Newark, New York and Philadelphia filed by Aero Finance and Peninsular Air Transport, since the fares have been cancelled.

Western Air Lines and the City and County of San Francisco's petitions for reconsideration in the Denver Service Case.

DENIED:

Southwest Airways permission to serve Paso Robles-San Luis Obispo, Calif., through the Paso Robles-San Luis Obispo County Airport.

Applications for exemption authority for service to Liberal, Kan., from various points filed by Central Airlines, Frontier Airlines, the City of Liberal and the Liberal Chamber of Commerce, the county of Seward, Kan.; City of Borger, Tex., and the Borger Chamber of Commerce; the City of Enid, Okla., and the Enid Chamber of Commerce. Applications of Central and Frontier for permanent authority for the service are set down for hearing.



Jet-to-jet refueling at 500 miles an hour

The Boeing jet tanker prototype is pictured above making a refueling contact with an eight-jet B-52 bomber.

This operation is part of an intensive test program in which every detail of America's first jet tanker, the Boeing KC-135, will be proved out well before the first production model rolls off the line.

For more than a year the Boeing prototype has been accumulating the kind of data obtainable only in actual flight. Resulting developments and design refinements have already been incorporated in the KC-135s now taking shape in Boeing's Renton, Washington, plant.

Besides proving out the airplane itself, the prototype makes it possible to test thoroughly the streamlined new Boeing Flying Boom, and all aspects of jet-to-jet refueling at speeds above 500 miles an hour, and altitudes over 35,000 feet. This means that when deliveries of the KC-135 to the Air Force begin, the airplane will be operationally proved. And it will be equipped with a flight-tested jet-speed refueling system.

The prototype has, during its hundreds of hours of grueling test flying, performed beyond expectations. This in part is a result of Boeing's unique experience designing and producing more large, multi-jet aircraft than any other company in the world. These include the B-52 eight-jet bomber, and more than 1200 six-jet B-47 medium bombers. In addition, Boeing pioneered the development of aerial refueling. It has built more than 600 Boeing KC-97s, the standard propeller-driven tanker of Strategic Air Command.

This is the unequalled background that gives assurance to the Air Force, and to the nation, that the Boeing KC-135 will be another outstanding, dependable aircraft.

BOEING

Airline Traffic — December 1955

	Total Revenue Passengers	Revenue Passenger Miles (000)	Load Factor	U. S. Mail Ton-Miles	Express Ton-Miles	Freight Ton-Miles	Total Revenue Ton-Miles	Per Cent Revenue to Available Ton-Miles
DOMESTIC								
American	563,659	341,863	**66.06**	2,089,774	1,140,264	6,675,012	43,329,898	**62.52**
Braniff	129,627	49,246	**57.39**	188,290	152,024	356,769	5,406,515	**52.57**
Capital	195,768	63,669	**58.46**	285,378	253,542	386,415	7,007,233	**45.08**
Colonial	29,043	7,244	**47.71**	20,176	8,160	34,634	753,934	**49.23**
Continental	51,891	18,991	**50.75**	98,608	35,154	133,192	2,082,968	**45.09**
Delta	165,752	76,890	**60.22**	376,432	272,858	650,385	8,675,161	**57.31**
Eastern	563,586	309,970	**57.60**	1,134,736	598,384	1,456,013	35,374,784	**47.28**
National	106,212	77,623	**58.41**	437,809	96,402	489,007	8,949,036	**60.12**
Northeast	39,603	8,032	**56.01**	15,735	16,436	23,772	801,346	**55.88**
Northwest	89,479	61,244	**57.64**	554,188	285,180	782,237	7,745,984	**54.44**
TransWorld	306,398	244,446	**62.18**	1,485,536	922,964	2,608,564	28,390,106	**59.41**
United	404,291	280,163	**60.88**	3,057,453	1,258,431	2,680,487	33,872,994	**55.68**
Western	84,011	41,651	**55.63**	334,120	93,059	223,454	4,626,412	**55.52**
INTERNATIONAL								
American	9,675	6,770	**61.91**	14,772	548	243,482	975,838	**64.82**
Braniff	2,723	5,897	**36.17**	46,181	.....	90,746	809,593	**39.61**
Caribbean Atlantic	12,816	984	**52.54**	1,985	.....	4,189	95,756	**50.19**
Colonial	1,661	1,284	**42.86**	160	.....	4,460	145,333	**46.55**
Delta	4,691	5,282	**54.21**	11,032	.....	73,855	626,731	**46.14**
Eastern	16,432	22,665	**60.38**	133,194	.....	102,470	2,696,154	**56.47**
National	9,632	5,563	**58.39**	10,642	3,929	45,336	640,306	**61.39**
Northwest	8,795	16,161	**53.04**	1,591,647	23,483	649,102	4,034,829	**75.25**
Pan American								
Alaska	5,323	9,464	**63.70**	65,475	.....	258,899	1,298,207	**56.50**
Atlantic	59,632	75,872	**60.30**	1,637,440	.....	2,164,768	11,960,789	**65.92**
Pacific	18,646	54,725	**63.69**	1,666,584	.....	1,089,848	8,531,365	**66.21**
Latin America	97,956	87,055	**59.01**	511,831	.....	3,428,349	12,507,062	**58.95**
Panagra	11,437	13,277	**54.79**	61,882	.....	879,388	1,790,805	**54.56**
Trans World	14,033	36,577	**52.64**	1,420,935	.....	732,560	6,190,717	**67.65**
United	5,576	14,592	**65.57**	190,995	.....	40,740	1,720,698	**73.54**
LOCAL SERVICE								
Allegheny	24,410	4,025	**40.83**	20,315	20,497	.....	424,454	**43.40**
Bonanza	8,564	1,876	**35.66**	5,821	2,664	5,244	192,690	**35.19**
Central	7,467	1,290	**28.53**	7,038	2,574	4,076	136,812	**28.59**
Frontier	12,504	3,509	**41.54**	27,468	8,027	46,657	417,155	**51.85**
Lake Central	8,770	1,379	**33.05**	2,412	11,439	.....	154,450	**35.05**
Mohawk	24,685	4,505	**52.52**	6,774	7,870	9,116	453,454	**52.86**
North Central	34,196	5,131	**44.36**	27,389	34,421	.....	550,462	**41.64**
Ozark	20,258	3,098	**33.34**	10,370	17,757	.....	317,673	**34.68**
Piedmont	29,968	5,999	**51.38**	22,558	14,971	16,392	627,456	**52.74**
Southern	13,895	2,420	**40.13**	13,134	13,413	.....	257,845	**39.46**
Southwest	19,510	3,929	**49.85**	11,568	5,580	14,774	406,079	**50.53**
Trans Texas	12,528	2,868	**37.49**	24,990	8,164	15,075	321,404	**36.76**
West Coast	14,513	2,642	**40.72**	7,120	2,007	5,597	259,850	**49.26**
HAWAIIAN								
Hawaiian	31,941	4,239	**55.70**	7,150	.....	135,788	520,701	**53.58**
Trans Pacific	14,152	1,760	**48.82**	2,602	.....	10,546	148,110	**48.98**
CARGO LINES								
Aerovias Sud Americana	.....	.....	.....	.....	.....	2,040,120	2,040,120	**61.17**
Flying Tiger								
Slick								
Riddle	.....	.....	.....	32,015	.....	4,414,056	4,446,071	**89.68**
HELICOPTER								
New York Airways	2,592	50	**71.43**	1,573	1,704	472	8,349	**56.90**
Los Angeles Airways	1,587	61	**25.10**	10,580	3,894	.....	19,705	**38.58**
Helicopter Air Service	.....	.....	.....	6,957	.....	.....	6,957	**41.72**

Compiled by* AVIATION WEEK *from airline reports to Civil Aeronautics Board.

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North American Asks Congress For Help in Fight for Low Fares

Washington—North American Airlines Group pleaded for congressional support in its fight "to preserve low-cost transportation" in testimony before the House Commerce Subcommittee on Aviation, headed by Rep. Oren Harris (D.-Ark.).

James Fischgrund, co-owner of the combine, declared that "a thorough congressional investigation and action is urgently needed to save the last remaining true 'price yardstick' competition in air transportation. The 12 big airlines now controlling 96% of the total business are determined to wipe out the only surviving competitive spurs safeguarding low-cost domestic and overseas air travel for the public."

Other witnesses to testify, as the subcommittee continued its study of civil aviation, were:

• **L. C. Burwell,** vice president, Flying Tiger Line, who protested legislation to eliminate Civil Aeronautics Board's exemption authority which makes it possible for the Board to promptly approve air operations without the requirement for a certificate of public convenience and necessity.

• **K. McMurray,** executive vice president, Air Line Pilots Assn., who urged that contract carriers be regulated to the same degree as scheduled lines and urged establishment of an independent air safety board.

McMurray also asked CAB authority to impose civil penalties for the filing of unrealistic scheduling requirements for well over two years without effective enforcement or remedial action being taken by the Board," he said.

McMurray declared that pilots, stewardesses, airline management and the public are opposed to serving liquor on air flights.

Burwell told the committee that if legislation were passed removing the Board's exemption authority, "We couldn't evacuate casualties in the event of an atomic attack without an act of Congress." He pointed out that both the all-cargo and local service airline industries got their start through the exemption authority.

Fischgrund maintained that "if Congress makes certain that competition is allowed to survive, jet age air travelers should be able to cross the U. S. in four hours for $50 and fly to Europe in about five hours for $100."

Two subcommittee members—Rep. Harris and Rep. John Bell Williams (D.-Miss.)—applauded North American Airlines' promotion of low-cost transportation but expressed concern at its disregard of CAB and the requirements of the 1938 Civil Aeronautics Act.

Williams commented to Fischgrund: "Whether the North American Airlines Group has operated legally or illegally, I think the list of firsts . . . is a good indication that you have made a very distinct contribution to civil aviation in this country.

"That in itself does not necessarily justify . . . the Board in granting everything you are asking. However, I think you are entitled to some consideration on that account."

Previously, Civil Aeronautics Board and Air Transport Assn. (AW Jan. 23, p. 106), Commerce Department and several other organizations (AW Jan. 30, p. 85) have appeared before the subcommittee.

London Will Construct Elevated Air Terminal

London—Work is scheduled to begin here this month on a downtown airlines terminal that will rest upon a steel and concrete platform 20 feet above a major subway junction on the western edge of the city. Present plans call for its completion by 1960.

The 75,000-square-foot, 3,500-ton platform will be supported by 80 steel columns and located in a triangular site between the subway tracks. Administrative offices, shops, a basement parking lot and other features will be included in the development.

Since British European Airways tenancy of the existing Waterloo Air Terminal will expire next year, a temporary terminal will be opened on the platform.

London Transport, the municipal transportation company, will be turned over to Air Terminals Ltd., an organization formed for the purpose by BEA, British Overseas Airways Corp. and Aer Lingus.

Shortlines

► **Alitalia,** the Italian airline, will start the first direct service between Venice and London in April with Convair equipment.

► **British Overseas Airways Corp.** says that its traffic between New York and Bermuda tripled in January, compared with January, 1955. The British airline carried 822 passengers last month and 238 in the previous January. Currently, the carrier operates a daily Super-Constellation tourist service and three Viscount first class flights a week to Bermuda.

► **Colombia's government** is negotiating with private interests for helicopter service in three separate areas. The mountainous terrain of the country presents problems in helicopter operations, but it also gives air transportation a vast advantage over the very slow land transport.

► **Continental Air Lines** has taken up its option on three Viscount 810/840 transports, bringing its total order to 15 and total Viscount sales to 277. Continental is taking an option on another five Viscounts.

► **Cubana,** the Cuban airline, has bought three Viscounts for delivery this spring and will receive two Super-G Constellations in April. The Viscounts will replace Constellations on the airline's Havana-Miami route, and the Super-Constellations will fly between Havana and New York and on the Mexico-Havana-Madrid route.

► **Delta Air Lines** and Southern Airways started a radio and newspaper campaign this month in 12 cities served by Southern to promote interline traffic between the two carriers.

► **Garuda Indonesia Airways** plans to expand operations in the Far East and will buy several medium-range transports in the United States and Great Britain. The next new route for the Indonesian airline is reported to be service between Jakarta and Hong Kong via Singapore and Bangkok.

► **Hong Kong Government** has issued five-year licenses to Macao Air Transport, Hong Kong Airways, Ltd., and Cathay Pacific Airways, Ltd. Macao Air Transport is licensed for a PBY service to Macao, and Hong Kong Airways for DC-4 service to Jakarta. Cathay Pacific is authorized to operate between Hong Kong and Saigon, Manila, Calcutta, Bangkok, and Singapore.

► **Lacsa,** the Costa Rican affiliate of Pan American World Airways, has started a weekly non-stop service between Panama and Puerto Rico with Convair 340 equipment.

► **Pan American World Airways** flew 687,202,000 passenger-miles in the fourth quarter of 1955, compared with 568,249,000 passenger-miles for the same quarter of 1954.

► **Trans World Airlines** is distributing a Guide to Hotel Facilities for Business Meetings and Conventions to various organizations to help them plan their meetings and conventions.

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COCKPIT VIEWPOINT

By Capt. R. C. Robson

Three Cheers for the Controllers

Complaining about Air Traffic Control is a popular pastime these days and one is often forgetful of the fact that these complaints are directed against the system—not the controllers. Let it be stated here and now that the job of Air Traffic Controller is one of the hardest and least rewarded of any in aviation. At the same time it is one of the most important.

It is impossible to describe accurately the conditions under which their work is performed. One has to spend time in a center and in the cockpit of an airplane to appreciate the true situation. But here is a letter from an anonymous controller which gives an indication of his work:

The 'Sweat Box'

"I don't like to sound like I'm bellyaching but after eight hours in that 'sweat box' I'm not fit for human companionship. Hour after hour the pressure is on with voices screaming over telephones, radios and intercoms. Everybody wants a clearance right now. And I'm not supposed to make mistakes even when I'm working radar and trying to follow a pip until my eyes burn. By the time I get home at night I find myself snapping at the wife and kids, taking my troubles out on them. I'd like to stay on the job but if things don't change soon I won't be fit for anything but the bughouse."

Corroborating this letter is the fact that there have been recent cases where controllers have broke down and wept after a few hours in the "sweat box." No wonder they resign or transfer to the hinterlands.

Due to the increased use of direct aircraft to center communications, many flights are on the center frequency 80 to 90% of the time. This means that the people in the center are providing more weather information (we have to get it someplace) and becoming more of a flight advisory service.

Information, Please

In early February I listened while an itinerant plane over New York asked for a clearance to Boston (his alternate) because the LaGuardia weather had gone sour. The controller, who had been working at top speed, said that he could provide this but, for the pilot's information, landings at Newark were still in progress and would he like to go there? The pilot said yes and a clearance was issued. Shortly thereafter the pilot came back asking for the frequency and identification of the Newark outer marker and ILS. Seems he had misplaced the appropriate approach chart. After a short pause the center provided this information along with the current weather.

This was an extra service entirely beyond the required job of the controller. It took extra effort and required a divergence in his normal procedure to look up the information. He could have issued a routine clearance to Boston and caused the pilot to fly several hundred extra miles.

Several things should be mentioned about the job of an Air Traffic Controller. Experienced men are valuable. Every effort should be made to keep them for they can mean the differenc of millions of dollars to aviation. But to keep these people means making their jobs more palatable. More pay always helps; they also need better tools, proper rest periods and facilities, shorter hours on duty and more job security.

Tempers occasionally get short during periods of traffic congestion but, again, this is primarily because of the system—not the people. From this corner I can't do more than give my personal thanks to center people the country over and add a rousing cheer for their good work. But the job needs substantially more than this.

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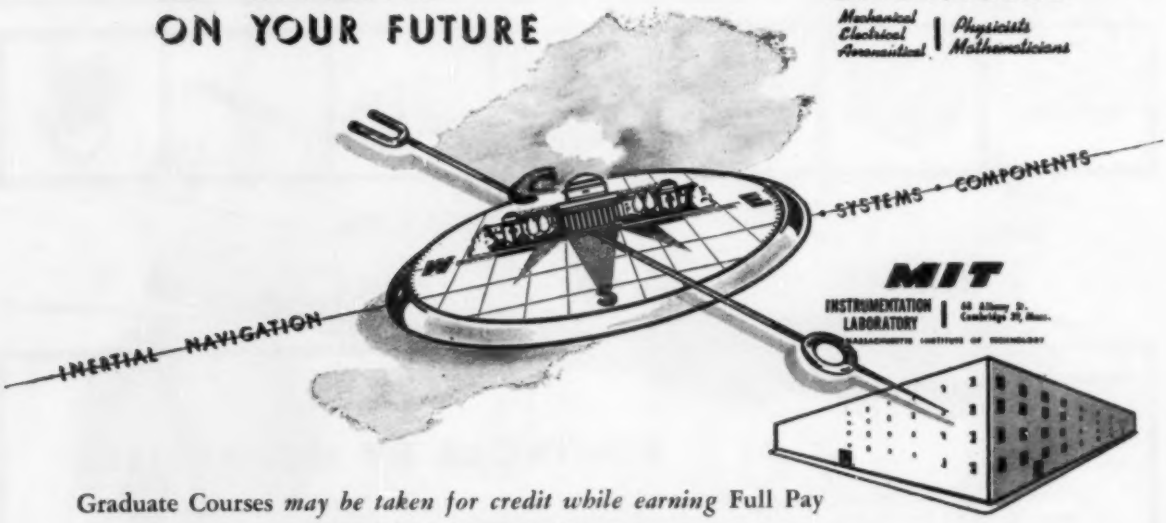

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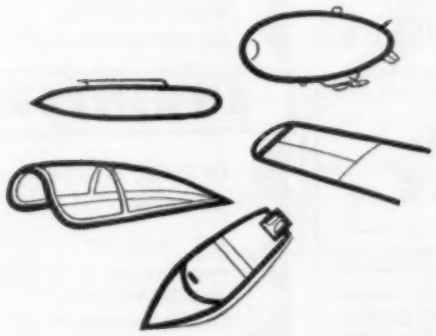

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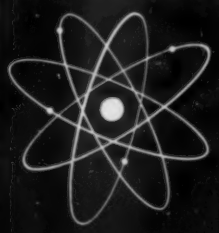

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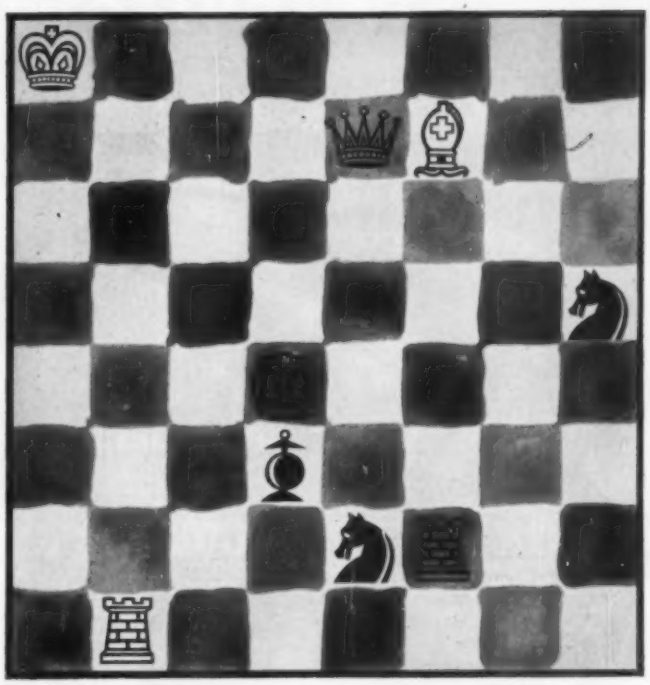

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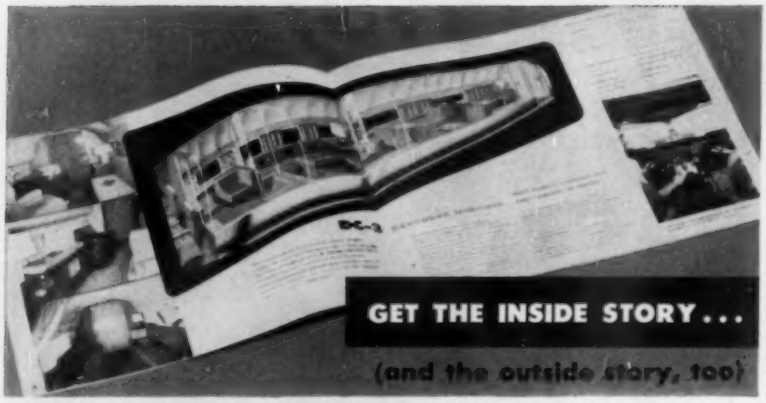

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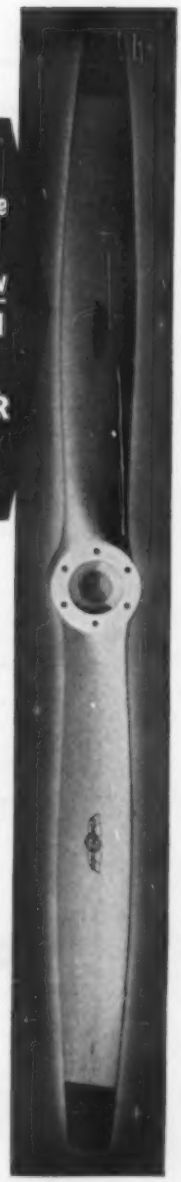

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LETTERS

The Airpower Fraud

The confirmation of AVIATION WEEK's recent account of serious maintenance skill shortage in the USAF should not be considered in cavalier fashion and quickly forgotten. It should drive home emphatically that the mere appropriation of billions does not create an Air Force in being and ready for the defense of this country.

What Senator Symington says about the plane availability in the Tactical Air Force of the USAF is undoubtedly so and reflects upon the top commands, the procurement agencies of the USAF, the maintenance agencies and the aircraft industry as a whole.

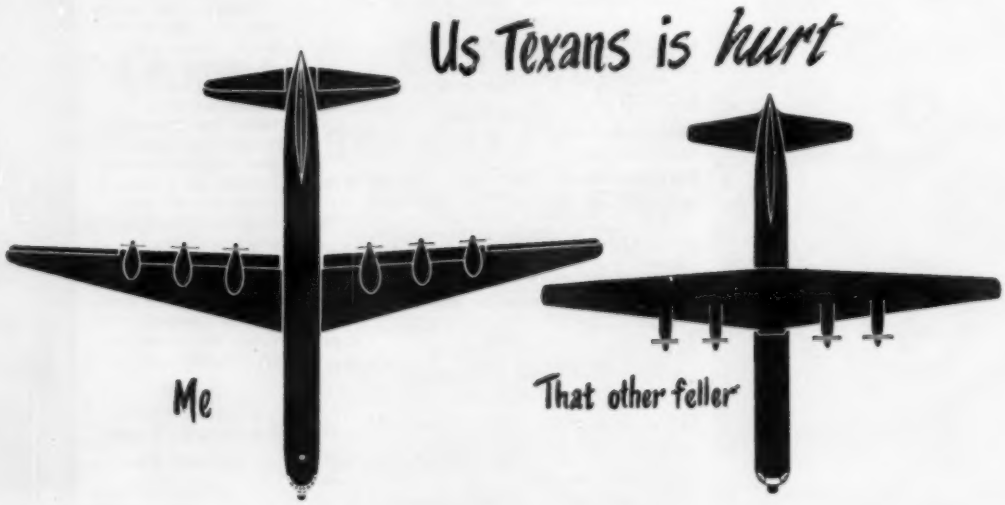
This problem is not a new one. It has plagued airpower for more than a score of years. Too few of the right spare parts are procured. Parts that are required for immediate use to remove a plane from the AOOC status are bogged down in the red tape of an inefficient spare parts supply system. Parts procured from the plane manufacturer on emergency TWX orders are also allowed to be bogged down by prime contractors who prefer to build planes instead of supply parts to the planes already built. It was a struggle during World War II to have right parts, at the right time, and the right place available to permit combat planes to be on flyable status. And all the fault does not lie with the prime manufacturer. Some planes are AOOC because Government Furnished Property on direct procurement to the USAF has been permitted to lapse in delivery dates. Another factor to consider is that philosophy of Air Force commanders to cannibalize existing equipment for spares instead of procuring spares in sufficient quantity. We could have a bigger Air Force than the Reds but it wouldn't do us any good sitting on the ground. I thought we learned that lesson in World War II but I assume we have forgotten it.

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

If manpower has been short of skill, maybe it would be better to obtain better training aids and more of them to fix existing planes instead of purchasing new supersonic fighters. But regardless of the cause of a grounded Air Force, aren't the people of the United States entitled to a fair shake by the Air Force? For years they complained no money. Now they have the money and one-third less flyable planes than they think they have.

Your photo of the McDonnell F3H-1s floating on barges down the Mississippi plus the charge of Senator Symington of a grounded Air Force is not one to make the writer feel that the administrative management of the Air Force and Defense Department is all that it should be. You are entirely correct when you charge a new airpower fraud in the 1957 budget. Isn't it time for a change?

WILLIS L. NYE
3038 Bridge Street
Hayward, California



San Antone, Texas
Feb. 3rd, 1956

Dear Mr. Editor,

Me and the family was sort of rumpled today to read in the papers that them Douglas people out in California have got a C-133A airplane they say can haul twice as much stuff as any plane flying around these days. Now down in San Antone, we think I'm pretty big, even for Texas, and I don't figure how they could be twice as big as me. About four years ago, I toted 104,000 lbs. of stuff on one trip. And I hauled 212 head (people, they was) on another trip last summer and could have handled another 175 or so without busting a bulkhead. Went over to Germany back in '53 with 61,000 lbs. My folks (that's Convair) rigged me to go 8100 miles without stopping at any waterholes. Got me about six thousand hours in the air now, and I ain't through yet. Got to go out to McClellan tomorrow, as a matter of fact. Now I don't want to be onreasonable, Mr. Editor, but us Texans got our pride. Seems to me them California fellers shouldn't of said that.

yrs. very truly
A Loyal Reader
C-99 Convair
(care of MATS, Kelly Air Force Base)

p.s. These here pictures up above is drawn to scale. That's me on the near side.

p.p.s. If you want to check my story, call Dick Gotee Gottschall down at Convair in San Diego. He's my publicity man.

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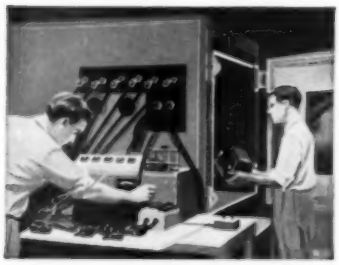

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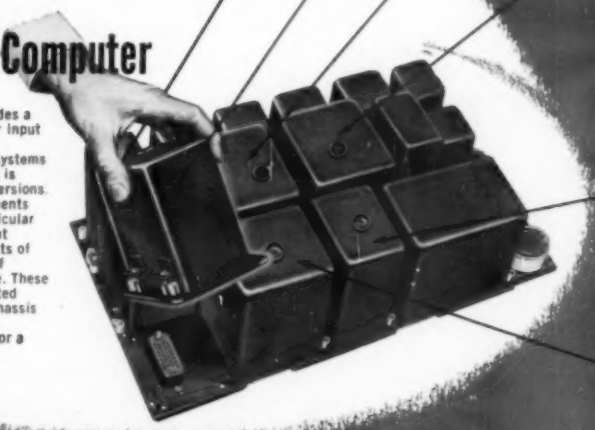

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